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THESIS

SPAWAR YEAR 2000 ASSESSMENT PHASE CASE STUDY

by

John Kevin O'Leary

September, 1997

Thesis Advisor: Tung Bui
Co-Advisor: Elizabeth M. Gramoy

Thesis
03883

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE September 1997	3. REPORT TYPE AND DATES COVERED Master's Thesis

4. TITLE AND SUBTITLE SPAWAR YEAR 2000 ASSESSMENT PHASE CASE STUDY	5. FUNDING NUMBERS
6. AUTHOR(S) O'Leary, John Kevin	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSORING / MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.

12a. DISTRIBUTION / AVAILABILITY STATEMENT	12b. DISTRIBUTION CODE
Approved for public release; distribution is unlimited.	

13. ABSTRACT *(maximum 200 words)*

This thesis involves a case study that surveys government systems within the Space and Naval Warfare Systems Command (SPAWAR) to (i) determine the Year 2000 impacts within their Department of the Navy (DoN) systems, (ii) compare this impact with current industry experience, and (iii) evaluate the cost drivers used in estimating costs within the DoN and determine if these cost drivers are valid for use in estimating Year 2000 costs for SPAWAR systems, and (iv) evaluate the Assessment Phase process. In this case study it was observed that the SPAWAR systems were impacted in the same manner by the Year 2000 problem as private industry. The SPAWAR systems cost modeling will require calibration for unique Year 2000 cost drivers in addition to cost drivers unique to the Department of Defense. The Year 2000 Assessment Phase requires strong management support and a centralized Year 2000 office responsible for all aspects of a Year 2000 effort.

14. SUBJECT TERMS Year 2000, SPAWAR Assessment Phase	15. NUMBER OF PAGES 126
	16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFI- CATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
Unclassified	Unclassified	Unclassified	UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. 239-18

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SPAWAR YEAR 2000 ASSESSMENT PHASE CASE STUDY

John Kevin O'Leary
B.S., New York State University, 1995

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN SOFTWARE ENGINEERING

from the

NAVAL POSTGRADUATE SCHOOL
September 1997

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ABSTRACT

This thesis involves a case study that surveys government systems within the Space and Naval Warfare Systems Command (SPAWAR) to (i) determine the Year 2000 impacts within their Department of the Navy (DoN) systems, (ii) compare this impact with current industry experience, (iii) evaluate the cost drivers used in estimating Year 2000 costs within the DoN and determine if these cost drivers are valid for use in estimating Year 2000 costs for SPAWAR systems, and (iv) evaluate the Assessment Phase process. In this case study it was observed that the SPAWAR systems were impacted in the same manner by the Year 2000 problem as private industry. The SPAWAR systems cost modeling will require calibration for unique Year 2000 cost drivers in addition to cost drivers unique to the Department of Defense. The Year 2000 Assessment Phase requires strong management support and a centralized Year 2000 office responsible for all aspects of a Year 2000 effort.

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I. YEAR 2000 PROBLEM

A. DESCRIPTION OF YEAR 2000 PROBLEM

As we approach the most anticipated new year of our lifetime, the Millennium, something else is looming on the horizon "The Year 2000 Problem".

> A June 2, 1997, Newsweek article titled "The Day the World Crashes", writes Drink deep from your champagne glasses as the ball drops in Times Square to usher in the year 2000. Whether you imbibe or not, the hangover may begin immediately. The power may go out. Or the credit card you pull out to pay for dinner may no longer be valid. If you try an ATM to get cash, that may not work, either. Or the elevator that took you to the party ballroom may be stuck on the ground floor. Or the parking garage you drove into earlier in the evening may charge you more than your yearly salary. Or your car might not start. Or the traffic lights might be on the blink. Or, when you get home, the phones may not work. The mail may show up, but your magazine subscriptions will have stopped, your government check may not arrive, your insurance policies may have expired. Or you may be out of a job. When you show up for work after the holiday, the factory or office building might be locked up, with a handwritten sign taped to the wall: Out of Business due to computer error. Could it really happen? Could the most anticipated New Year's Eve party in our lifetimes really usher in a digital nightmare when our computer dependent civilization grinds to a halt? Incredibly, according to computer experts, corporate information officers, congressional leaders and basically anyone who's given the matter a fair hearing, the answer is yes! Yes, unless we successfully complete the most ambitious and costly technology project in history, one where the payoff comes not in amassing riches or extending Web access, but securing raw survival. What is the problem? It's called, variously, the Year 2000 Problem, Y2K or the Millennium Bug. [Ref. 1]

The Year 2000 Problem is receiving increasing attention throughout the world. It is going to affect everyone and its deadline is will not change.

> According to Kevin Schick of the Gartner Group [Ref. 2], The year 2000 is not rocket science, but it is the largest project ever to be undertaken by the IT organization. The complexity of the project is not in the solution but rather in the size and scope of the project itself .
>
> Melvin Scott of Boeing Information Services and Philip H. Newcomb of The Software Revolution, Inc. write Although the government has gone through extensive software changes, because of its pervasiveness, the Y2K problem is arguably of unprecedented scope and complexity. It involves a multitude of dependencies between software, hardware, databases, systems, interfaces, businesses, and regulatory relationships that involve coordination between

multiple organizations, enterprises, agencies, and thousands of software package and database suppliers.[Ref. 3]

Ed Yourdon's introduction to the February 1996 issue of American Programmer states, For nearly 20 years, I've been joking to my professional colleagues, and to my non-technical friends outside the industry, that in 1999 I plan to sell all my earthly belongings and move to a small island in the Pacific, in the hope that it will be a safe haven during the chaos surrounding the so-called "century date change." [Ref. 4]

Given this, its easy to understand why many are referring to the Year 2000 problem as the single largest computer effort ever.

Capers Jones states [Ref. 5], "The Year 2000 problem will be one of the most expensive problems in human history."

The Gartner Group estimates that the cost to correct the problem worldwide could run between $300 - $600 billion dollars. Where is all this money going to come from to fix these systems? For commercial companies, the money will come from an increase in the cost of goods and services. For the government, the money will come from increased tax revenues, or postponed or canceled services. Many companies may suffer financially and this will impact the worldwide economy. In addition, the longer an organization waits, the more it will cost, because consulting rates to help solve the problem are currently increasing as the demand for this support continues to increase. Organizations will need to evaluate their Year 2000 budgets and refine these as they proceed through the Year 2000 effort.

Peter de Jager in his web article "You've got to be Kidding!" explains in a very simplistic way how and why this situation happened. He states we programmed computers to store the date in the following format dd/mm/yy. This means that we've allowed 2 digits for the day (dd), 2 digits for the month (mm) and only 2 digits for the year (yy). Some examples might help. If you were born on June 2, 1952, that information would be stored in the computer as 06/02/52.

January 1st 2000 will be stored in the computer as 01/01/00. We've told the computer to assume that 06/02/52 means 06/02/1952. What will it assume 01/01/00 means? It will assume that 01/01/00 means 01/01/1900 or January 1st 1900. And that is the problem. Many computers will think that all dates past December 31st 1999 are 100 years in the past. To understand the implications of this error, we must look at one of the most basic, and most common, calculations performed by the computer: the calculation that determines how much time has passed from one event to the next. For example, how old are you? I was born on June 2, 1952. If I ask the computer how old I am, it subtracts my birth date from the current date. It will perform a calculation similar to 97-52 (remember it only has 2 digits for the year information) and gives the answer of 45 years old, which, while unfortunate, is also true! On January 1st 2000, the calculation will be exactly the same. Subtract my birth year from the current year, 00-52 and the computer will proclaim that I'm -52 years old, which is obviously incorrect. This will cause havoc with every similar calculation in every program in every company in every country, worldwide. It affects more than just age calculations. It affects all information based on time. When will your driver's license expire? When will your credit card expire? When will this drug no longer be safe? When should this machine undergo regular maintenance? When was this product built? How long has this invoice been overdue? Has this subscription expired? All of these calculations are based on the date, and if the computer does not know what date it is, then these calculations are no longer possible... Why did we use only 2 digits when we knew we'd need 4 digits when the Year 2000 rolled around? It was done deliberately, but with the very best of intentions. When computers first entered the business world in the late 1960s and the early 1970s, they were very expensive. This expense was tied directly to two aspects of computing, how much data could the computer store and how fast could it process that data. Even tiny, incremental increases in either attribute resulted in huge cost increases. One way to store data, was on a piece of stiff cardboard known as a Hollerith card. By literally punching holes into this Hollerith card according to a set of patterns, and reading those patterns with a beam of light, one could store and retrieve information. Each of these cards had enough space to hold only 80 characters of information. Eighty characters is not a lot of information... So (programmers) compromised. They wrote 230155 instead of 23/01/1955, thereby saving themselves 4 precious characters, 2 of which were the crucial '19'. When designing a computer application, compromises are always made such as between what is desirable and what is affordable and between the speed of delivery and the quality of the final product. Hopefully, the consequences of the compromise are understood and accepted ahead of time, because compromises are never perfect solutions. We compromised on accuracy vs. cost when we decided to store only 2 digits of the year. The reasoning to do so, even now, makes a lot of sense, especially if the era in which this happened is kept in mind... the year 2000 was 30 or 40 years away. Part of the reasoning was that surely the code would be replaced by then...That particular assumption has proven to be very wrong, as

evidenced by the large quantity of old code, known as Legacy Systems, in use today...It seemed a very reasonable compromise to make at the time. And compromises are never made in isolation, compromises are always a conspiracy or collaboration. Computer managers would tell the client that if they stored all 4 digits they'd have to buy a bigger computer or they'd have to write a much more complicated program to store the data on 2 or 3 or 4 Hollerith cards. The client would typically respond 'You want me to spend another million dollars to store an extra 2 digits that won't even be used for 30 years! In fact, why not store a single digit and save even more money?' So, this compromise became an industry standard. [Ref. 6]

The MITRE Corporation is a Federally Funded Research and Development Corporation (FFRDC) tasked by many agencies within the federal government to support these agencies in understanding and solving their Y2K problems.

The description of the Y2K problem is explained on their Y2K Home Page Unfortunately, the problem is not isolated to programming errors caused by the use of the two-digit year coding scheme. The year 2000 presents a triple witching hour of potential traps for designers and programmers. In addition to the two-digit year coding, there are distinct issues surrounding the use of the six-digit date representation, and still other risks caused by the calculation of the leap year. And just to make matters worse, January 1, 2000 falls on a Saturday. Problems caused by coding errors may not be discovered until the next regular working day, allowing enough time for the errors to inflict a great deal of damage. [Ref. 4] They continue by defining the Y2K problem as involving any or all of the following instances:

- Two-Digit Year Coding, use of two digits to represent the year, is expected to be the most common cause of year 2000 failure. Applications that require the user to enter a date routinely present a two-digit field to the operator in an attempt to reduce the number of keystrokes needed to enter data. Failure to append the correct century to the value after input results in an inability to distinguish between 1900 and 2000.
- Six-Digit Date Coding is common in administrative information systems. Planning and scheduling systems, human resources systems, financial and billing systems, and many other programs use the convention where a calendar date is represented as two digits for year, two digits for month, and two digits for day. Using six digit date coding, April 12, 1954 would be represented as 540412. This coding method is typically used where the application is attempting to determine which of two dates is earlier in time, or if a certain deadline has passed. These tests are frequently coded with a single inequality statement used to compare the two six-digit dates.
- Leap Year is another complicating factor in the millennium problem. The year

2000 is a leap year. The three rules which the Gregorian calendar uses to determine leap year are as follows:

Years divisible by four are leap years, unless...

Years also divisible by 100 are not leap years, except...

Years divisible by 400 are leap years.

Therefore, the year 2000 is a leap year according to rule number three. It is interesting to note that the above rules apply only to the Gregorian calendar. Julian dates, named after Julius Caesar, represented dates as the number of days since the mythical founding of ancient Rome. The Julian calendar invented in the Eighteenth Century changed the base to 4713 B.C. based on astronomical considerations. Other dates, which are written as two digits for the year and three digits for the day of the year, are often used to compute the number of days between days. To calculate the number of days between two given dates, two Gregorian dates are translated into Julian dates and subtracted to yield the number of days between the two dates. Different representations for storing the year, month, and day in a fixed number of digits and shortcuts to converting dates to full Julian date format will all overflow during the period 1998-2001.

- Hard coding and Magic Numbers is another area of problems which comes from hard coding values in software routines such as "19" for the implied century and/or use of "99" or "00" as reserved values meaning "never delete this" or "this is a demonstration account" respectively (sometimes called "magic numbers") which limit the range of year values and may cause date comparisons to fail or pollute output values. Other magic number dates include: 9/9/99, 99/99/99, 1/1/1, 1/1/11, 6/9/69, 6/7/89, 1/23/45, 6/6/66, 7/7/77, 8/8/88, and 12/31/99.
- Limiting Date Range Size, the final area of problems concerns platform limitations. Specifically, the internal date representations of COTS hardware and software components, software date data types which are stored as an increment over some base date, may roll over and fail due to the storage register filling up. [Ref. 4]

Exacerbating the issue is the fact that the Year 2000 problem will not stop abruptly in the Year 2000. Year 2000 costs will continue beyond the turn of the century, some of these costs will include: fixing Year 2000 problems that were missed, repairing bad fixes that accidentally introduced new errors, completing Year 2000 efforts that were not completed on time, completing new applications that were intended to replace existing legacy software, hardware upgrades and performance re-tuning of applications whose performance was degraded by Year 2000 fixes and litigation expenses for the host of anticipated Year 2000 law suits.

B. EXAMPLES OF YEAR 2000 PROBLEMS

According to multiple sources, including the June 2, 1997 issue of Newsweek, Congressional Related Year 2000 Hearings, the Software Technology Support Center article by Bryce Ragland titled Are You Ready for the 21st Century?, and results from some DoN assessments, some situations that may arise if the year 2000 problems are not dealt with include the following:

- Hospitals: Everything from neonatal monitors, X-ray machines and CT scanners to patient-record databases, prescription-dispensing equipment and blood-bank dating systems needs to be evaluated. In most cases, hospitals have to rely on manufacturers to do the testing.
- Elevators: Most elevators have embedded systems that monitor the amount of time between maintenance checks. If these automated devices calculate that the allowable time between maintenance checks has been exceeded, most elevators will go to the bottom floor in the elevator shaft, take themselves out of service, and remain at the bottom of the shaft until maintenance is performed and the clock is reset.
- Electricity: When the Hawaiian Electric utility in Honolulu ran tests on its system to see if it would be affected by the Y2K Bug, "basically, it just stopped working," says systems analyst Wendell Ito. If the problem had gone un-addressed, not only would some customers have potentially lost power, but others could have got their juice at a higher frequency, in which case, "the clocks would go faster, and some things could blow up," explains Ito.
- Nuclear Power: The Nuclear Regulatory Commission says that the Bug might affect "security control, radiation monitoring... and accumulated burn-up programs (which involve calculations to estimate the hazard posed by radioactive fuel)." Radioactive material waste tanks are monitored and some are controlled by automated sensors and other devices. They all work on date-sensitive trend analysis. What will happen to trend analysis when there is perceived to be a 99-year span between two measurements?
- Communications: "If no one dealt with the year 2000 Bug, the phone network would not operate properly," says Eric Summer Jr., a Lucent chief technology officer. He's not talking about dial tones, but things like billing. Certain commercial operations that run phone systems by computer could also go silent if the software isn't fixed. If the phone system that malfunctions is the 911 emergency system for a municipality, the very lives of the city's population could be at risk.
- Medicine: Besides the expected mess in billing systems, insurance claims and patient records, hospitals and doctors have to worry about embedded chips - microprocessors inside all sorts of devices that sometimes have date-sensitive

controls. The year 2000 won't make pacemakers stop dead, but it could affect the data readouts it reports to physicians resulting in misinterpretation of data readouts and administration of improper medical care.

- Weapons: Newsweek had obtained an internal Pentagon study listing the Y2K impact on weapons and battlefield technologies. In their current state, "a year 2000 problem exists" in several key military technologies and they will require upgrading or adjustments. One intelligence system reverts to the year 1900, another reboots to 1969. The report confidently states that as far as nuclear devices like Trident missiles are concerned, "there are no major obstacles which will prevent them from being totally Year 2000 compliant by January 1999."
- Money: Banks and other financial institutions generally will go bonkers if they don't fix the year 2000 problem. The Senate Banking Committee is even worried that computers might automatically erase the last 99 years' worth of bank records. Some Y2K consultants are advising consumers to make sure they don't enter the 1999 holiday without obtaining hard-copy evidence of their assets. According to Jack Webb of HONOR Technologies, Inc., ATMs won't work without fixes. On January 3, 1997, trading on the Brussels stock Exchange was halted for three hours because the trading system was unable to function after the date changed from 1996 to 1997.

Bryce Ragland of the Software Technology Support Center speculates On December 1, 1999, you invest $1,000 in a certificate of deposit (CD) that offers 12 percent simple annual interest. On January 1, 2000, your CD should be worth $1,010. Instead, it is worth -$10,990...Just think what this could do to your retirement, savings accounts, stocks, or bonds. On the other hand, if the computed interest was stored in an unsigned integer field (deposits are not suppose to earn negative interest), your one-month investment would be worth +$10,990. This would be great for you, but what about the owner of the investment company or the person in charge of the savings plan?

- Food: In Britain computers at the Marks & Spencer company have already mistakenly ordered the destruction of tons of corned beef, believing they were more than 100 years old.
- Air Traffic Control: "We are still in the assessment stage, determining how big the problem is," says Dennis DeGaetano of the Federal Aviation Administration. One possible danger is computer lockup: while planes will keep moving at 12:01a.m. on Jan. 1, 2000, the screens monitoring them, if not upgraded, might lock. Or the computers might know where the planes were, but mix them up with flights recorded at the same time on a previous day.
- Factories: Ford Motor Co. reports that if the Bug isn't fixed, its buildings could literally shut down - the factories have security systems linked to the year. "Obviously, if you don't fix it, your business will stop in the year 2000," says Ford's David Principato. Even if a manufacturing company aggressively

solves its own problem, though, it might still have to close if its suppliers do not deal with the problem. Most manufacturing plants are highly automated. A small manufacturer of industrial liquid solutions found their production line completely stopped on January 1, 1997. It was discovered that their process control systems were not designed to account for leap year (1996) and subsequently shut down when the year changed from 1996 to 1997. Before the company personnel could remedy the situation, the liquid solutions that were in the process pipelines hardened and could not be removed. The company was forced to replace the process pipelines at a cost of $1 million.

- Automobiles: Vehicles could have as many as 100 chips; if they are calendar-challenged, experts say, forget about driving. Its been determined that chips in some makes will fail and the car will stop dead at midnight December 31, 1999.
- DMV: The DMV changed driver's license expiration dates to December 31, 1999 to keep the renewal systems from failing.
- State Government: Of the state of California's 2600 computer systems, 450 are considered mission critical, these include computers that control toll bridges, traffic lights, lottery payments, prisoner releases, welfare checks, tax collection and handling toxic chemicals, all of which could have year 2000 problems.
- Federal Government: Of the DoD's approximate 22,000 systems, more than half are non-Year 2000 compliant and include systems such as the Global Positioning System which uses a 1024 week cycle and rolls back to January 1980 in August 1999, Space Warning Systems which reject 00 as the year resulting in not being able to retrieve or delete messages, meteorological systems which will not accept star data for 2000 and beyond, Logistics Information Systems using 2-digit dates which have already failed and would have erroneously deleted 80,000 inventory records have a solution not been implemented, command and control and information distribution systems had incorrect leap year calculations which prevent messages from being sent and received between ground, air, and sea.
- Computers and Software applications: Date related problems have already been found and, in some cases, solved in applications and computers including Pentium, Tandem, Unisys, Share/43, Oracle, Microsoft, Visual C++ , PC Real Time Clocks, and many COTS products whose licenses expire prematurely in 2000.
- Misc.: There are many other critical, and common-place, business and government systems which have date related functions and could malfunction at the turn of the century. A partial list includes: Security systems for badge readers, entry gates, vaults and home security, parking lot lights, street lights, uninterruptable power supplies, fax machines, electronic time clocks, landscaping systems, vending machines, thermostats, microwave ovens, digital watches, televisions, and VCRs. [Refs. 2, 12, and 13]

The bottom line is there are a lot of systems that effect almost every aspect of our everyday life. And none of them can be assumed to be year 2000 compliant.

> Leon Kappelman an academic and Y2K consultant states [Ref. 1], "Anybody who tells you 'Oh, it's OK' without knowing it's been tested is in denial."

C. ECONOMIC IMPACT OF YEAR 2000 PROBLEMS

Almost all computer-based systems, worldwide, will be adversely affected by the arrival of the Year 2000, unless something is done to repair or replace these systems.

> As businesses finally come to terms with the inevitable, it's going to be panic time. In about a year, expect most of the commercial world to be totally obsessed with the year 2000 Bug...But no amount of money or resources will postpone the year 2000. It will arrive on time, even if all too many computers fail to recognize its presence. [Ref. 1]

> Peter de Jager, one of the leading proponents of the year 2000 problem, recently said that "If you're not changing code by November 1997, you will not get this thing done on time - it's that simple."

And that date is based on the assumption that you will be using sophisticated tools and experienced personnel using them. The start date to complete this effort without tools and using inexperienced personnel was a year ago. Most major corporations and government have year 2000 task forces with varying degrees of funding and personnel. Unfortunately time is running short, some of the major companies that have already been expending major efforts to resolve this problem are looking at contingencies if they don't get the job done.

> Peter de Jager goes on to state "Those companies who have begun to address the issue, have never overestimated the amount of time required to solve the problem. The problem has always proven to be larger, uglier and more costly than anyone imagined."

What is going to happen to the companies that have still not started? The Gartner Group

is estimating that half of all businesses are going to fall short. Some Year 2000 experts predict that more than 5 percent of all companies will go out of business because of their failure to solve their Y2K problems. Others estimate the number to be as high as 35 percent. This would put a significant number of people out of work, and seriously impact the global economy.

> According to what the Morgan Stanley study maintains is a conservative estimate, more than 150,000 people will be needed worldwide to work on year 2000 compliance. The danger isn't so much that labor costs will rise further as it is that organizations that wait too long will find no one available at any price.[Ref. 9]

The Gartner Group estimates the cost to deal with Y2K could go as high as $600 billion worldwide. That cost does not include the litigation that will inevitably follow the system failures.

> "You could make some very reasonable extrapolations about litigation that take you over $1 trillion, and those are very conservative estimates, says Dean Morehous, a San Francisco lawyer [Ref. 1]."
>
> According to Vito C. Peraino, a trial lawyer for Hancock Rothert and Bunshoft in his testimony before congress [Ref. 10], "The year 2000 problem may represent the biggest litigation wave our country has ever seen."
>
> In considering the pervasiveness of the problem, IBM estimates that 70 percent to 90 percent of customer application programs are affected, Of these programs, 4 percent to 6 percent of the lines of code (LOC) are affected. The New York Transit Authority provided an experience report at a recent Y2K conference indicating they found 80 percent of their modules affected, and 1 percent of the LOC required modification. At the same conference, two insurance companies said that between 5 percent and 11 percent of their LOC required modification. [Ref. 11]
>
> As bad as it seems in the United States, the rest of the world is lagging far behind in fixing the problem. Britain has recently awakened to the crisis - a survey last year showed that 90 percent of board of directors knew of it - but the head of Britain's Taskforce 2000, Robin Guenier...(stated) 'I'm not saying we're doomed, but if we are not doing better in six months, I really will be worried'. He expects the cost to top $50 billion for Britain alone. On the continent of Europe, things are much worse...observers fear that when countries like Germany and France finally tackle the year 2000 problem it might be too late. Russia seems complacent.

Mikhail Gorbachev met with Representative Horn in Washington, expressing concern about how far behind Russia is... and its possible impact on the country's nuclear safeguards.[Ref. 1]

Peter de Jager wrote in early 1997, "less than 35% of North American businesses have addressed this issue in any significant manner and based upon informal surveys, Europe is even further behind, with less than 10% of organizations actively solving this problem."

And, the question asked at the beginning of this chapter is, where is all this money going to come from to fix Y2K impacted systems? For commercial companies, the money will come from an increase in the price of the goods and services that they provide. For the government, the money will come from increased taxes, or delayed, canceled, or reduced services they provide. Many companies may suffer financially and this will effect the worldwide economy.

D. SUMMARY

The Year 2000 problem is a result of optimizing computer space and processing time by omitting the two century digits in date fields. At the time it was done it made financial sense. Now these optimizing techniques could potentially stop many of the world's computers if not fixed before January 1, 2000.

There is a significant amount of work that needs to be done during the next 2 years. The effort currently under way is to raise awareness to the seriousness of the problem and to assess the impacts, risks, costs, and possible solutions. The pervasiveness of the Year 2000 problem demands a worldwide effort to ensure that the computer-based systems we have come to depend upon are still functioning at the turn of the century. To fix Year 2000 problems does not demand a high level of technical expertise, it does demand good software engineering principles and solid project management.

However, The hope of a "silver bullet" solution is a dream that doesn't exist. There are tools that will help "find" some of the problems, in some of the software, on some of the hardware; and there are tools that will "fix" some of the problems, in some of the software, on some of the hardware. There aren't any tools that will "find and fix" all of the problems in all of the software, on all of the hardware. [Ref. 12]

The challenge in addressing this problem of unprecedented magnitude is managing it.

> Margaret Powell, the first DoN Y2K Action Officer wrote Managing the Year 2000 effort will take the cooperation of professionals at every level to be actively involved. System owners, users, designers, programmers, and maintainers will all need to understand each others' roles and work as a team. The challenge is different than most other efforts in at least two ways. First, Y2K can potentially affect every system in operation today...Second, the Y2K deadline can not be slipped. As a result, senior managers face the unenviable challenge of identifying the affects of Y2K within their organization and developing sound, economical strategies to resolve the problem prior to the turn of the century. [Ref. 13]

To quote Peter de Jager, "There are two kinds of people, those who aren't working on the year 2000 problem and aren't worried, and those who are working on it and are terrified."

II. FEDERAL GOVERNMENT YEAR 2000 APPROACH and STATUS

A. FEDERAL GOVERNMENT YEAR 2000 STRATEGY

The goal within the federal government and private industry is to achieve Year 2000 compliance. What exactly is Year 2000 compliance? The federal government has recently issued the following definition in the Federal Acquisition Regulation 39.002, dated 2 Jan. 1997:

> "Year 2000 compliant means information technology that accurately processes date/time data (including, but not limited to, calculating, comparing, and sequencing) from, into, and between the twentieth and twenty-first centuries, and the years 1999 and 2000 and leap year calculations. Furthermore, Year 2000 compliant information technology, when used in combination with other information technology, shall accurately process date/time data if the other information technology properly exchanges date/time data with it."

> A report of the U.S. Office of Management and Budget (OMB), Getting Federal Computers Ready for 2000, states The potential impact on Federal programs if this problem is not corrected is substantial and, potentially very serious...There are several unique characteristics of this problem that shape the Federal strategy for addressing it. First, it has an immovable deadline...This characteristic makes time the singe most critical resource. Second, unlike normal system development or maintenance activity, many systems must be tackled concurrently. Comparisons and computations using dates permeate computer systems within the Federal government, throughout the State and local governments, and in the private sector. There is thus a real potential for substantial strain on another key resource --expertise. Third, complexity is increased by concurrent changes to multiply systems and elements within a system (e.g., the operating system). Because computer systems inter-operate and share data, the modified systems must be tested together. Furthermore, all of these changes must be made and tested while the current systems continue to operate...The Government's strategy is predicated on three considerations. First, senior managers will take whatever action is necessary to address the problem once they are aware of its potential consequences...Second, there can and will not be a single solution. Solving this problem requires technicians and engineers to write or revise software code and to replace hardware. A "silver bullet" is a logical impossibility...Third, given the limited amount of time, emphasis will be on mission critical systems...The Federal strategy relies on the newly established CIOs (Chief Information Officers) to direct that work and to follow industry's best practices. [Ref. 14]

> The current Federal strategy is dependent on the involvement of senior managers under leadership of CIOs in each agency, who in turn interact with the CIO Council and the Year 2000 Interagency Working Group under the supervision of OMB. A significant accomplishment of the Year 2000 Interagency Working Group is the publication of the Best Practices guide which outlines each phase of the process federal agencies should adopt to address their year 2000 impact.[Ref. 7]

The Year 2000 Goals and Objectives for the DoD is outlined in The DoD Year 2000 Management Plan: The goal is to ensure that no system failures occur due to Y2K related problems. Objectives include:

- Minimize the adverse impact of Y2K date processing in all mission and mission support systems
- Define and share DoD-wide, consistent strategies for finding and fixing Y2K problems, and testing solutions
- Minimize the duplication of effort for finding and fixing Y2K problems, and testing solutions
- Minimize the impact of resource reallocation to support Y2K efforts
- Minimize the risk and cost for determining the appropriate Y2K solution for each system
- Recognize the Y2K problem as an opportunity to retire legacy systems early
- Identify, prioritize, and mobilize the needed resources for system conversions and replacements.

However, the federal government has been slow to recognize the significance of the Year 2000 problem. A recent meeting of the Committee on Government Reform and Oversight, chaired by Honorable Stephen Horn issued the following report on July 30, 1996 dealing with the US Federal Government Year 2000 Survey:

> As Chairman of the Subcommittee on Government Management, Information and Technology, I am releasing the results of a survey sent to 24 major departments and agencies. The survey, which was sent on April 29, 1996, requested that agencies provide the subcommittee with a status report of when and at what expense agencies plan to address the problem of computer software which currently is unable to recognize the year 2000. The federal government's computer systems rely on accurate date fields to calculate age, transfer money, and

determine maintenance schedules for national security systems. Without converting these fields to interpret the turn of the century, government systems could potentially eliminate the transfer of money, erase database systems needed to send checks to eligible benefit recipients, and adversely impact critical missions, such as those conducted by the Department of Defense.

On April 16, 1996, the subcommittee held a hearing to determine the extent of this computer problem. The hearing revealed that there is a serious lack of awareness of the problem on the part of a great number of people in business and in government. Even more alarming was the cost estimate reported to the subcommittee to remedy this problem which was said to be $30 billion for the federal government alone. In response to these findings I, along with Congresswoman Maloney, developed a number of questions to better understand what federal agencies are doing to prevent a possible disaster. Are they taking the necessary steps to identify the problem? Are they providing the necessary human and capital resources to correct the problem? Have they developed plans to achieve a successful launching of their systems into the 21st century? The responses received from Federal agencies, in most cases, provided us with limited information, on when and at what cost agencies plan to correct this potentially disastrous computer software conversion problem. Even with this information, an outline forms, which portrays a Federal government unable to meet the challenges of the 21st century because of a lack of awareness and preparedness. Some of our major findings include:

Major departments are in the initial planning stages of this effort, even though, agencies need to have their systems inventoried and fixed by 1998, in order to provide sufficient time to test and ensure total accuracy. This means, in the next year and a half these departments must complete their plans, inventory and fix millions of lines of code, while simultaneously meeting agency needs. Even those agencies considered leaders on this issue, such as the Social Security Administration, and the Department of Defense are not close to completing the inventory and solution stages of conversion. According to the information received, only six agencies have cost estimates on the monetary resources needed to solve the problem. In fact the Department of Health and Human Services, has cost estimates for only two divisions, amounting to $125 million. The Department of Agriculture has cost estimates for only one division, amounting to $5.6 million. The total estimate for these six agencies and their departments is $298 million. The Department of Defense has not yet completed its inventory of computer software code which needs to be converted. The cost estimate to fix the 358 million estimated lines of code to be reviewed could cost between $1.02 and $8.52 per line. This means the cost to review and fix DoD systems could range somewhere between $358 million and $3 billion. NASA, one of the most innovative, advanced and computer dependent agencies in the Federal government, has not prepared a plan to solve the problem and does not anticipate having a plan completed until March 1997 -- this leaves less than a year to inventory, and fix systems. The Department of Transportation, which includes the

Federal Aviation Administration, Federal Highway Administration and the Federal Railroad Administration did not respond to the questions as of this date. The Department of Energy did not begin to address the year 2000 issue until a week after it received the subcommittee's survey. [Ref. 7]

The latest update to the above committees findings was issued in the OMB first quarterly report to congress on the governments' Year 2000 preparedness issued June 23, 1997.

In it the committee indicated that the federal government will now spend $2.8 billion to make its systems process year 2000 dates correctly, up from an original estimate of $2.3 billion. This latest report which again compiled data from 24 federal agencies, stated that 7,649 mission critical systems had been identified, excluding the Social Security Administration, which reports in modules. Also, some agencies reported missing or incomplete data, so this total , along with cost estimates, will continue to rise. Of the total number of systems, 59 percent are being repaired, 9 percent are being replaced, 8 percent are being retired, 21 percent are already year 2000 compliant, and 3 percent await evaluation. Other high level findings indicate that 18 of 24 agencies are still in the assessment phase. As a weighted average, the government is 65 percent done with its assessment and 17 percent complete with renovation. Cost estimates exclude normal system upgrades or replacements as well as the federal share of state information systems. Estimates continue to be termed preliminary. Other items of interest in the OMB report show six agencies still working to complete their assessments during the second half of this year. Five agencies plan to complete system validations in the second half of 1999, including the Department of Transportation which, the report indicates, plans to finish its work by December, 1999. Of the federal systems, the Social Security Administration appears to be in the lead, with 100 percent of Year 2000 mission critical systems assessed, 65 percent converted, 55 percent validated and 50 percent implemented. Others reporting relatively fast progress are the Federal Emergency Management Agency, the Small Business Administration and the Environmental Protection Agency. Those that appear to be bringing up the rear include the Departments of Agriculture, Education, Housing and Urban Development, Justice and National Science Foundation. The OMB says that agencies have made a good start in addressing the year 2000 problem. No mission critical systems are reported behind schedule. This optimistic view is not shared by all observers. They feel that the OMB report indicates many agencies are operating with a very narrow window to turn their date problems around. They also noted that much of the cost identified in the report is limited to specific year 2000 contract spending, while much of this work is being performed under existing maintenance and support contracts. The Honorable Stephen Horn held hearings last year to determine if the federal agencies were taking steps to prevent a possible computer disaster, and was flabbergasted at the lack of preparedness. His committee assigned each

department a letter grade. A few, notably the Social Security Administration (SSA), were given A's. The SSA has been working on the problem for eight years and now has it 65 percent completed; at that rate it will almost make the deadline. Those with no plan in place, i.e. NASA and the Veterans Administration, got D's. Special dishonor was given to places where inaction could be critical, yet complacency still ruled, like the departments of Labor, Energy, and Transportation. [Ref. 15]

One of the major challenges facing the federal government is how to determine the overall cost of this effort. The Gartner Group estimates costs for the federal government to correct the problem to be at least $30 billion. Currently the Office of Management and Budget (OMB) has estimated the effort at $2.8 billion which is up 500 million from the OMB estimate earlier this year. The overwhelming scope of this effort and limited modeling data have resulted in wide ranges in estimated costs to resolve the year 2000 problem.

B. DEPARTMENT OF DEFENSE/ DEPARTMENT OF THE NAVY YEAR 2000 APPROACH

The United States Department of Defense (DoD) is responsible for one of the largest collections of systems in the world. Its inventory includes numerous hardware platforms, software programs and firmware that have been employed over the years to meet all of the information, real-time, and defense related tasks required across the various branches of the DoD. So how is the Department of Defense dealing with achieving Year 2000 compliance on the century's largest software maintenance project in history in terms of cost and scope?

On January 31, 1997, Mr. Anthony Valletta, Deputy Assistant Secretary of Defense (Command, Control, Communications and Intelligence Acquisition) spoke at "The Millennium Crisis: Time is Running Out for Federal Agencies" conference, sponsored by the Information Technology Association of America (ITAA) and Government Computer News. An excerpt from his speech highlights the state of Y2K in DoD, 'We understand we are faced with a very serious situation. In fact, we are handling it as if it were a virus which is set to become active in the Year 2000, and earlier in some case. We have millions of lines of code, much of which has been around for a long time. The code all to often is not well-documented, and some of the source code is no longer available...(and) we don't have a complete inventory (of our systems)...Where we are unique, is in our

> embedded software that is in our weapons systems -- missiles, tanks, planes, and ships...There are not enough software Operations and Maintenance (O&M) dollars to pay for finding and fixing Year 2000 problems, and testing Year 2000 solution. That means there will be tradeoffs required...Because of our extensive inventory of commercial products in DoD, we are especially concerned about what is often referred to as "systems software;" software such as operating systems, and database management systems. We need to know what commercial products will properly handle the Year 2000, or the date by which the vendor certifies that any shortcoming will be corrected. [Ref. 12]
>
> He goes on to outline the major obstacles he feels need to be addressed: senior management must be convinced of the magnitude of the problem and get them to commit the resources to solve it; interfaces among systems must be an area of focus; and the January 1, 2000 deadline is unslippable [Ref. 12].

The DoD Year 2000 project's success will be determined by how well it is able to successfully complete the large number of tasks, across the entire spectrum or projects and infrastructure throughout the organization. The Year 2000 problem is primarily an exercise in large scale project management. Unlike new development projects, year 2000 efforts do not involve leading edge technologies or unfamiliar methodologies. This effort requires the same software engineering skills and activities normally used to develop and maintain current applications. While smaller projects may be managed on an ad hoc basis, formal project management skills and processes are required to manage the year 2000 project. To this end, the Department of Defense, has adopted a Year 2000 approach based on a centralized policy with decentralized execution. This approach, based on the Y2K Interagency Working Group Best Practices, is made up of five specific phases. The five phases ensure that each system is fully assessed for Y2K impact, a plan is developed to correct any and all problem(s), the correction(s) are fully tested, and the system is back in full operation by the deadline of November 1999. DoN Year 2000 correction efforts are categorized into these five phases, and within each of these phases is a set of tasks to be completed.

> Each DoN system may only require the execution of some of the tasks, depending on the nature of the system's Year 2000 problems and the specifics of the system's life-cycle and operational situation. Additionally, some system Year 2000 "fixes" may include hardware replacements and upgrades. For systems requiring all of the steps, the cost will still be a function of several factors including: the types of Year 2000 problems facing the system, the chosen

solutions, the efficiency of the maintenance workforce making the corrections, the languages in the system, the type of application, and the level and complexity of testing required.[Ref. 16]

Following is a list of the five phases and the tasks associated with each phase. For a complete copy of the DoD Year 2000 Management Plan, and more descriptions of these phases and tasks, see the Department of Defense home page located at http://www.doncio.navy.mil/y2k/dodmgtpln.doc

- AWARENESS PHASE:

- Define the problem
- Establish the project team
- Obtain high level management support
- Make a business case
- Decide upon an overall approach
- Make oral and written presentations
- Publish articles in agency technical newsletters
- Prepare articles for corporate publications
- Brief each application area
- Identify technical and management representatives for each department
- Move beyond the IT community
- Brief non systems departments
- Determine exposures in infrastructure:
  - Access/environmental/elevators/security/fire
- Define terms (Glossary)
- Establish compliance standards for new systems
- Start preparation of project plan

- ASSESSMENT PHASE:
- Code inventory
- Develop methodology for conducting inventory
  - Select inventory team
    - Conduct inventory of source code
    - Determine LOC
    - Identify languages
- Collect survey information
- Missing source code
  - Identify tasks related to missing source code
  - Map source to executables
  - Prepare a list of no source modules

    - Determine which modules must be re-created
    - Assign responsibility for re-creating lost code
    - Rewrite needed missing modules
    - Identify source recovery vendor
- Vendor software
- Contractor maintained software
- Pilots
    - Determine need for pilots
    - Conduct pilots
    - Submit pilot code to vendors for comparison
- Make decision on manual vs automated method
- Make decision on in house resources vs contractors
- Identify technical issues requiring resolution
- Form technical team
- Screen input issues
    - Determine strategy for screen dates (2 or 4 position)
    - Print and distribute decision paper
- Forms
    - Form subgroup to handle issues relating to forms
    - Resolve issues with pre-printed forms
    - Resolve issues with computer-generated forms
- Estimating system costs for the year 2000
- Survey available tools
- Conduct procurement for tools and/or services if necessary
- Determine costs using survey results and industry standards
- Prepare master schedule for Renovation and Validation Phases
- Conduct risk analysis
- Prioritize systems for future phases
    - Make decisions on modification, re-engineering and retirement of systems /programs
- Decide on validation approach
- Identify data exchanges handled by operations, application areas, and non systems departments
    - Resolve date formats
    - Establish schedule for conversion of data exchanges
    - Determine need for bridges/filters
- Complete preparation of project plan

- RENOVATION PHASE:

- Implement standardized date routines
- Re-Engineer selected systems/programs

- Retire selected systems/programs
- Determine strategy for code modification by system (expand/algorithm/sliding scale/bridge)
- Install and utilize selected year 2000 tools
- Develop bridges/filters
- Re-create missing source code
- Change files and databases
- Validation Phase
- Create isolated future testing environment
- Determine resources needed
  - Storage
  - Processing capacity
- Resolve technical issues
- Determine how files will be aged
- Volume testing vs individual case testing
- Establish validation databases
- Coordinate future validation efforts with ongoing development
- Utilize existing tools
- Regression test all changed systems
- Future date test all changed systems

- IMPLEMENTATION PHASE:

- Schedule implementation of all changed systems, vendor software and hardware
- Make decision on parallel processing
- Resolve data exchange issues
- No data received
- Bad data received
- Consider use of hot sites for file conversion
- Decide on handling of archive files
- Develop backup/recovery plans
- Project Management
- Form Systems Project Team
- Form Non-Systems Project Team
- Conduct status meetings
- Track progress to plan
- Develop funding requirements and develop strategies for funding
- Brief senior management on status

Following is the current DoN schedule for completion of each of the five phases:

Phase	Planned Completion Date:
• Phase One - AWARENESS	December 1996
• Phase Two - ASSESSMENT	June 1997
• Phase Three - RENOVATION	December 1998
• Phase Four - VALIDATION	January 1999
• Phase Five - IMPLEMENTATION	November 1, 1999

C. DEPARTMENT OF DEFENSE YEAR 2000 STATUS

Figure 1 represents the Year 2000 status within the DOD as of July 1997. Over 50% of the systems in the DOD are currently reporting as non Year 2000 compliant. It is obvious from this report that the DOD has a significant effort ahead in order to resolve the year 2000 problem. The majority of its systems are in the Assessment and Renovation phases. If the DOD experience is similar to that of private industry, they will begin to find they have underestimated this effort as they get deeper into the Renovation phase.

D. DEPARTMENT OF THE NAVY YEAR 2000 STATUS

The DoN has adopted the 5 phased approach promulgated by the DOD and has issued the DoN Year 2000 Action Plan detailing the actions necessary to implement that approach within the DoN. The following outlines the current status of the DoN in implementing the Year 2000 Action Plan:

The DoN has placed a high priority on Year 2000 compliance for its systems. In March 1997 they conducted a Year 2000 status review with each of the System Commands, the Bureau of Medicine and Surgery, and the Bureau of Naval Personnel. Representatives from CNO, and the Atlantic and Pacific Fleets attended the review. The results revealed that additional systems are being identified that were not originally assessed, additional non-compliance status is being reported by commercial off the shelf (COTS) vendors, and the overall costs are increasing. It was determined that the DoN Chief Information Officer (CIO) would conduct quarterly Year 2000 reviews to expedite

resolution of the Year 2000 problem. As indicated, the DoN has adopted the DOD five phased approach to the resolution of the Year 2000 problem. Currently approximately 70% of the DoN systems have completed the Assessment phase. The estimated cost to fix the DoN Year 2000 problem is $234M. The goal for the DoN is to have every mission critical system Year 2000 compliant by December 1998, giving them all of 1999 to perform comprehensive intersystem tests.

Because of the potential far-reaching impacts of not properly addressing interfaces among systems, the DoN CIO is requiring that each functional area conduct a Year 2000 Interface.

TOTAL SYSTEMS - ALL SEGMENTS (MISSION CRITICAL, DIST, AND NON-DIST											
							Mission Critical Systems				
Acronym	Total Systems	Number of Compliant Systems	Number Non-compliant	Being Replaced	Planned Terminations	Systems to repair/replace	Assess-ment	Reno-vation	Vali-dation	Implemen-tation	Total
Army	13,687	7,857	5,830	84	6	5,824	530	2,717	428	61	3,736
DON	1,970	690	1,280	0	20	1,260	338	381	16	39	774
USAF	2,584	710	1,874	56	16	1,858	1,154	284	131	118	1,687
JS	311	1	310	0	6	304	214	9	34	1	258
BMDO	75	19	56	3	1	55	33	19	1	0	53
DCAA	2	2	0	0	0	0	0	0	0	0	0
DeCA	36	3	33	0	0	33	5	8	8	10	31
DFAS	186	59	127	24	0	127	63	60	2	1	126
DIA	109	0	109	51	0	109	90	6	13	0	109
DIA/DODIIS	109	9	100	11	3	97	46	26	25	0	97
DIS	7	2	0	0	0	0	0	0	0	0	0
DISA	339	73	266	16	12	254	56	107	7	11	181
DLA	333	55	278	0	0	278	98	35	26	22	181
DSAA	11	0	11	0	0	11	0	6	0	1	7
DSWA	115	35	80	0	0	80	62	0	0	4	66
NIMA	222	73	149	0	57	92	35	46	0	0	81
NRO	27	0	27	0	0	27	24	3	0	0	27
NSA	1,573	63	1,510	50	14	1,496	1,070	320	53	53	1,496
OASD/HA	112	40	72	0	0	72	27	15	6	24	72
AFIS	0	0	0	0	0	0	0	0	0	0	0
OSIA	41	3	0	0	0	0	0	3	0	0	3
USD(A&T)	75	0	0	0	0	0	26	6	0	34	66
WHS	136	84	52	0	0	52	8	12	27	5	52
	22060	9778	12164	295	135	12029	3879	4063	777	384	9103

Figure 1. DOD System Status

Assessment to ensure that information systems and processes that pass data to other systems are being addressed, and will be Year 2000 compliant, and tested, prior to January 1, 2000. As of July 1997 initial interface assessments had been conducted for the Financial, Intelligence, Logistics, Command and Control, and Communications functional areas. The Communications interface assessments included such areas as AUTODIN/DMS, DISN, FLTSATCOM, Navy Telecommunications Network Management Systems, ELF communications, Air Force Network Control Center, AFSATCOM, MILSTAR, Theater Deployable communications and Telephone switches for all services. Functional areas yet to be assessed include Military Personnel and Readiness, Procurement/Contract Administration, Civilian Personnel, Information Management, Space, Meteorology, Systems Acquisition Management, Weapons, Environment Security, Health Affairs, Science and Technology, Test and Evaluation, Nuclear, Chemical and Biological, Reserve Affairs, Transportation, and Industrial Affairs and Installations. These interface assessments will be repeated for all functional areas until there is assurance that the Year 2000 problems in those areas have been resolved.

Based on a July 19, 1997 Navy SITREP promulgated by RADM Stephen Johnson, Commander Naval Information Systems Management Command, some specific examples of DoN systems Year 2000 status include:

- Trident: In view of the nuclear weapons nature of the tactical software and hardware, it is reviewed and updated on a regular basis, therefore, analysis and assessment on all tactical systems has been completed. Based on this assessment, all corrections have been identified and have either already been corrected or will be corrected prior to Year 2000 as part of normal system upgrades using existing funding. The Year 2000 problem will not cause any disruption to the operation of the Strategic Weapon System and there is no major obstacles which will prevent this system from being totally Year 2000 compliant by January 1999.
- Cruise Missile: In view of the weapons nature of the Cruise Missile system all tactical software and hardware is reviewed and updated on a regular basis. Analysis and assessment of the tactical systems reflects that those systems

which have identified as having a Year 2000 impact will be fixed in subsequent releases prior to Year 2000 impact.

- AEGIS: The AEGIS Weapon System (AWS) was analyzed for impact due to the Year 2000 problem. Calendar date is not a variable in the AWS processing to deliver ordinance on target. Testing has been conducted in the AEGIS computer center and no anomalies were identified in the Ordnance on target processing. The only errors identified were incorrect display of the year in one CRT. This will be corrected in the next release. Year 2000 certification will be included in the annual combat system integration test.
- Global Positioning System (GPS), will be ready for both the End-of-Week and Year 2000 rollovers. The GPS Joint Program Office has been working this problem for years and have exhaustively analyzed the problem and have an action plan in place and are on track. They plan to replace legacy systems, that are not Year 2000 compliant, with a new system.
- Telephone switches: All the services have a major telephone switch problem. NCTC is currently evaluating the problem for the Navy. Currently the DoN has approximately 64 non-compliant telephone switches at an estimated cost to fix of $45M.
- Facilities: NAVFAC staff coordinated with the Naval Facilities Engineering Services Center to propose a plan for assessment of facilities systems with embedded information technology (IT). The proposal is being submitted for consideration. The assessment could include elevators, digital device controllers, security systems, boiler control, energy management and control systems, remote metering, and other facilities-related embedded IT. A pilot project will be conducted at San Diego and Norfolk to determine the extent of this problem. As of July, funding has not been provided for this project.
- Contracts: The Naval Information Systems Management Center has recently awarded an Information Technology Support Services Blanket Purchasing Agreement. This contracting vehicle will allow contracting officers

immediate assess to vendors that provide Year 2000 solutions to their software problems.

- NAVSEA: Their solution of choice is to re-host business systems and upgrade weapons systems through the maintenance process. NAVSEA expects all systems to be implemented as Year 2000 compliant by June 1999. NAVSEA's major risk will be the ability to obtain short fall funding and the potential impact on its customers where funds must be redirected from meeting operational commitments due to lack of sufficient resources. Estimated cost impact to NAVSEA is $8M.
- NAVSUP: They have targeted full implementation by December 1998. NAVSUP's Year 2000 effort is supported by a Fleet Material Support Office tiger team. They have identified 308 systems to assess for Year 2000 compliance, 17 of which are mission critical. Renovation is underway on 58 systems and 55 are already Year 2000 compliant. At least 34 system are scheduled to be out of production by 2000. NAVSUP's risks center around resources: funding $16M, availability of Year 2000 tools for DoD wide use, and test facilities at the Defense MegaCenters. The test facilities risk is also identified by BUPERS and is contingent on the DMC's being upgraded to OS390, a Year 2000 compliant operating system.
- NAVAIR: The NAVAIR community organized a team of 8 team leaders and 62 competency members to develop and execute a top-level plan for ensuring Year 2000 compliance. NAVAIR's strategy is to prioritize their 4392 systems (2260 are already Year 2000 compliant, 562 are in renovation, 1372 have not completed assessment, and 172 will be terminated by 2000) as mission-critical, mission-essential, NAVAIR-wide systems, and other local systems. NAVAIR identified a cost impact of approximately $9M.
- BUPERS: Identified 73 systems as mission essential. The Year 2000 will impact mobilization, re-enlistment, manning readiness, and manpower/personnel requirements. The strategy is for system migration to new applications, DBMS, and client-server environment, assimilating legacy

systems functionality into new information systems. BUPERS is tracking the delivery of new or migration systems which will impact termination of 7 legacy systems, 3 of which have contingency plans already in place. BUPERS identified several major risks: funding, resolution of data exchange issues, and availability of test facilities.

- NAVFAC: Their assessment of 74 AIS systems indicated that 40 systems are under renovation and 14 systems report no Year 2000 problems. NAVFAC indicated that fixes for its AIS systems were minor programming changes. Some fixes will not be in place until the next scheduled releases of the application software.

E. SUMMARY

It has become apparent from the testimony before congressional subcommittees by top managers of federal agencies that there is wide disagreement over the severity of the year 2000 problem within the federal government. Some managers are confident the current Year 2000 effort will be successful, while others are calling for the federal government to speed up compliance efforts because the majority of the federal agencies did not plan to finish their Year 2000 compliance efforts until November or December 1999, which would leave no room for error. In the current report to Congress, just 18 of 24 agencies had completed assessments of their year 2000 efforts by the federally mandated due date of June 1997. The six agencies not meeting the deadline account for an estimated 70 percent of the total cost of compliance.

> Joel Willmessen, the top Y2K watcher at the General Accounting Office, stated OMB's perspective that agencies have made a good start and that no mission-critical systems were reported to be behind schedule would seem to imply that there is no cause for alarm. On the contrary, we believe ample evidence exists that OMB and key federal agencies need to heighten their levels of concern and move with more urgency. [Ref. 7]

> In an analysis of testimony before Congress in July, and as reported in an ITAA Weekly Outlook report, the Gartner Group felt the fact the government was dealing with the problem at this high level was a positive sign, however, based on

the fact that large scale government projects seldom meet even optimistic schedules, they expressed concern that a proposed November 1999 completion date posed a high risk, and that, if anything, the report underestimated the government's problems. They stated that enterprises at this phase of their year 2000 efforts often significantly underestimate their cost of compliance because of excessive optimism, downright ignorance, or both. The Gartner Group recommended that to meet the Year 2000 deadline, federal offices and agencies should first complete an assessment and define their applications' "time horizon to failure" which is the date at which applications with forward looking calculations will fail and cannot be fixed in the time left for normal maintenance. These organizations must then develop plans to achieve Year 2000 compliance throughout their agency within this time horizon. Although almost two-thirds of this planning is complete, some of the due dates of projects fall in very late 1999. Since the vast majority of IT projects are canceled, completed late, or delivered with scaled-down functionality (in this case, failure would likely manifest itself as poor quality), there is a significant risk when plans do not include explicit buffer periods to insulate the project. The year 2000 problem will not cause the U. S. government to go out of business. However, the business community must also be concerned since they will be directly affected by additional taxes required to correct the problem beyond 2000 or by the inability of U. S. (or other) government agencies or offices to deliver adequate services. Finally they felt that private industry needed to develop a risk assessment plan dealing with the impact on them due to failures resulting from year 2000 governmental noncompliance.

The Gartner Group recommended the U. S. government's efforts to address the year 2000 problem, need to accelerate, and that the U. S. Congress should support their efforts by allocating sufficient funds to do so. Currently the agencies are being expected to absorb this cost out of current funding which has seriously effected the effort and resources that have been placed on this task. Oversight committees have devoted much attention to determining exactly how much the compliance effort will cost. "Exact" is certainly a misnomer in this context because, without detailed assessment and solution design, any estimate will almost certainly be wrong. Instead of estimate overkill, scarce resources should be applied to fixing the problem. The year 2000 will not go away; it will cost what it will cost, and it will cost more tomorrow than it does today. [Ref. 15]

III. YEAR 2000 COST ESTIMATION WITHIN THE DOD

A. DOD COST ESTIMATION APPROACH

> At this point, it is difficult to know if the problem is a $358 million or a $3 billion problem for the DOD because of the uncertainty in estimating the scope and resolution effort. A 1995 MITRE study of approximately 5.4 million lines of code from nine command and control systems and two logistics systems showed that approximately 1.16 percent of the code dealt with date manipulation. The MITRE study estimated the cost of corrective maintenance to these systems at between $.75 to $1.70 per line of code (LOC) for application information systems and $1 to $8.52 per LOC for command and control systems. [Ref.16]

The Assessment phase, in which the majority of the DOD is currently engaged, deals with those activities required to define the scope of the problem and set up the infrastructure necessary to solve it. The primary purpose of the Assessment Phase is to gather and analyze information in order to determine the size and scope of the problem. Only after the size and scope have been determined, can an estimate of the cost, in terms of dollars and work years, be made.

> On January 14, 1997 Emmett Paige, Jr., OSD/C3I, wrote it is important that we use a single cost estimating metric in our reports to congress, OMB, and others. The estimates furnished now will be revised as we move along in the overall process. The metric we will use is executable lines of code (ELOC) x $1.10 for all automated information systems except for embedded weapon systems, for embedded weapon systems we will use executable lines of code X $8.00. These estimates will be refined by each Mildep/agency/CINC's/OJCS as the assessment phase is completed. I recognize that in some cases you might already have more accurate estimates for specific systems. Where required to break the estimates down in finer detail than reflected above, we will use that more refined/more accurate information with an explanation for each specific estimate that explains the metrics used to compute that cost.

This was done to standardize the estimates between organizations and throughout organizations and provides the first indication of the level of effort which must be accomplished. Although this is a "ballpark" estimate, it nevertheless provides a common basis for comparison across government and industry.

Once a rough work year estimate has been obtained, it is time to begin an in-depth analysis of the costs associated with solving the Year 2000 problem. For many

organizations, there will be a single opportunity to request funding. It becomes very important, therefore, to make the cost estimation as accurate as possible. There are a number of factors which will influence the cost of making code Year 2000 compliant in addition to modifying software. These factors include building the test environment, buying tools and services, adding hardware, upgrading operating system software and commercial products, etc. The Department of Defense has developed a checklist for estimating costs for the year 2000. Appendix B includes a copy of the "Year 2000 Cost Factors" checklist that serves as an aid in estimating system year 2000 costs. The checklist indicates those areas where costs should be adjusted because of specific environment.

The Gartner Group is an independent advisor to business professionals making information technology (IT) decisions. They have developed the following Year 2000 cost estimation aids for program managers. Applying this formula requires an accurate system inventory which includes source lines of code (SLOC). This formula provides a rough estimate, plus or minus 40 percent of the actual cost and includes project management, labor costs, locating and identifying affected code/data, parsing and analyzing for affected code data, determination of options, implementation of solutions, unit and integration testing, and implementation. The following estimation formula was developed by the Gartner Group and adopted by the DOD. A two step process can be used to produce a rough order of magnitude for system applications.

Step 1: Multiply SLOC x .80. This will determine executable lines of code (ELOC).

Step 2: Multiply ELOC x $1.70.* for AIS systems

Multiply ELOC x $8.00 for Weapon Systems

Note: *The Gartner Group recently increased this figure from a $1.10 to $1.70.

The Gartner Group also proposes that application complexity can be estimated, and used to further refine the cost estimate, provided other information is available such as the following:

- Function of component
- Type of component (create, read, delete, update)

- Number of physical transaction paths in the component and which ones involve dates or date-based operations
- Amount and type of actions in which dates are used (e.g., sort, compute and "if" statements)
- Age and size of application (an indicator of applied methods and technology)
- Date field count
- Date/LOC ratio

Examples of complexity classifications include:

Simple: 5 - 15 hours

Moderate:15 - 30 hours and

Complex: 30 - 45 hours

The formula is (hours x rate) x (percent x total components).

For example:

For 8,000 components (20% Complex, 50 % Moderate, and 30 % Simple), the estimate range would be $7.2M to $13.7M.

The Gartner Group also provides a date field expansion estimate based on $3.00 to $4.50 per data record. This includes programming modifications required for accommodation of the new date format. Date field expansion is likely to affect a greater percentage of programs than a programmatic solution, and represents increased logistical and project management costs due to the need to replicate and modify databases, and due to interface requirements. Depending on the year 2000 solution selected and the information available the above approaches will help in providing a high level year 2000 cost estimate.

The MITRE Corporation, an independent consultant for the federal government, recently released the following costs estimates in an effort to help DOD services and agencies develop rough orders of magnitude. To get an understanding of how the Year 2000 problems will impact military systems, they analyzed a range of applications from across the services which included Ground and Airborne Radar Systems,

Communications Processing Systems, Command and Control (C2) Planning Systems, and Logistics Support Systems. For these types of systems their analysis showed a range of costs, calculated as a function of the executable lines of code, as follows:

- Ground and Airborne Radar Systems: $2.02 - $8.52 per LOC
- Communications Processing Systems: $1.23 - $5.54 per LOC
- C2 Planning Systems: $1.22 - $1.84 per LOC
- Logistics Support Systems: $1.02 - $1.39 per LOC
- MIS Systems: $0.75 - $1.70 per LOC

However, these costs may not be what real systems experience. For example, if a system is under maintenance with scheduled releases and upgrades, the Year 2000 changes can be rolled into the ongoing changes for testing and fielding purposes, thus avoiding separate Year 2000 activities for these two steps. This is especially significant for systems which require test ranges and test vehicles or that require secure operation and have high availability requirements, since the testing and fielding steps for these systems are extremely expensive and complex.

B. EVALUATION OF YEAR 2000 COST DRIVERS WITHIN THE DOD

Figure 2 lays out the year 2000 cost drivers, which were identified as a result of this case study, as being either unique to a Year 2000 effort or deviate significantly from values currently used in parametric costing models for traditional software development or maintenance efforts. Pluses and minuses indicate the relative degree to which these cost factors will effect cost estimates for the year 2000. The following paragraphs describe each of these unique year 2000 cost factors:

- RESOURCE AVAILABILITY - Resources include people/labor, time, money. The resources to fix the year 2000 problem will become harder to come by as the year 2000 approaches.

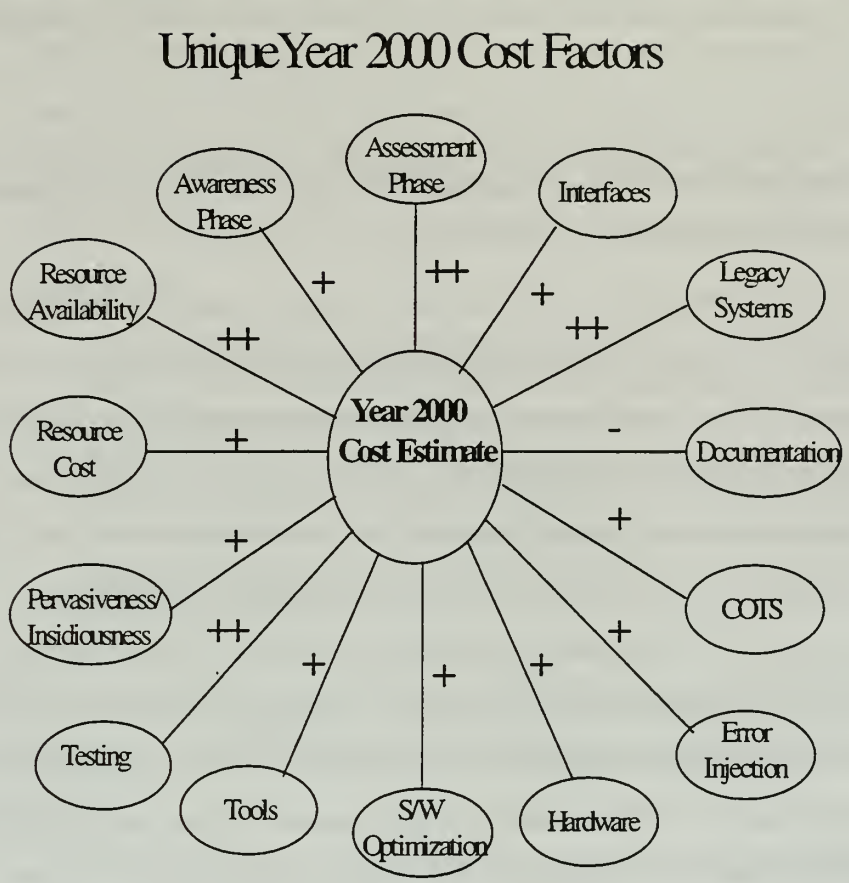

Figure 2. Year 2000 Cost Drivers

According to what the Morgan Stanley study maintains is a conservative estimate, more than 150,000 people will be needed worldwide to work on year 2000 compliance. The danger isn't so much that labor costs will rise further as it is that organizations that wait too long will find no one available at any price. [Ref. 9]

Despite the soaring costs, Gartner's Hall warns against obsessing over them. Companies should instead keep a close eye on the calendar, because we are limited by resources, not cost. [Ref. 9]

With the Year 2000 problem this may not be possible due to the enormity and breadth of the effort worldwide. Also, some legacy systems that have been in a caretaker status for some time with no plans to modify have no existing experts available. Many of these systems are written in old languages and may have few resources available. As several year 2000 experts have indicated, the date to start making systems year 2000 compliant, using experts with advanced tools, with a reasonable expectation of completing, is October 1997. The date to begin this effort with average technical personnel without sophisticated tools was last year. As has been emphasized the due date for this project cannot be slipped. Historically, the majority of large software projects are not completed on time. The current schedule, being proposed by the various services, i.e. completion by November 1999, allows very little room for such delays. The current approach within the DOD is that the various services will take the cost of this effort out of existing funding. This approach has seriously impacted the ability of the services to respond in a rapid manner.

- RESOURCE COST - The cost of resources to find and fix the Year 2000 problems will increase significantly as the year 2000 approaches.

  Bruce Hall, research director for application-development methods and management at the Gartner Group Inc., says labor costs for Year 2000 projects are up 30% since last year, when they averaged $60 an hour, and are still climbing. The revised labor cost works out to about $1.50 per line of code, up from $1.10. The increase may lead Gartner to raise its widely cited estimate of $300 - $600 Billion for all corporate year-2000 projects. This dramatic increase in labor costs is driving more US firms to hire overseas programming companies to do their year 2000 work, which could increase significantly during the next year. One study estimated that 15% of companies are moving toward outsourcing their year 2000 work, of these, 25% are

moving the work offshore. Analysts estimate that overseas companies typically charge 40 percent - 50 percent less than US firms for the same job. [Ref. 9]

- PERVASIVNESS AND INSIDIOUSNESS OF THE PROBLEM - The pervasive and insidious nature of this problem make it extremely difficult to find all occurrences of the problem. Date variables can be named anything, which makes it extremely difficult for tools or humans to find every instance to evaluate.

  To quote from the Newsweek article Even the most diligent companies don't have total confidence they can fix everything. Consider BankBoston, the 15th largest commercial bank in the United States. To stop a meltdown, BankBoston has to probe 60 million lines of code. The harder Bankboston works at solving the problem - it now has 40 people working full time on it - the more complicated it seems. Everyday, when we see something new we haven't thought about we get additional angst, says Iacino, who heads up this effort. [Ref. 1]

Because of the difficulty in finding all occurrences of year 2000 problems, organization's year 2000 efforts will extend longer and cost more than originally estimated.

- TESTING - Testing will consume a major part of the Year 2000 effort. Some estimates put this effort at 50% of a Year 2000 effort. Validating the results of Year 2000 efforts is by far the greatest technical challenge faced by Year 2000 projects. Multiple levels of tests will be required for virtually every application within an organization. At a minimum, these tests must certify the compliance of applications that already handle century dates. Year 2000 dates can appear in virtually all components of an application, necessitating full integration and system testing to ensure the correctness of those changes. Testing does not stop at the application's boundaries, interfaces between applications also require verification. This level of testing will be required for all of an organizations applications. This testing effort can be aided through the use of tools designed to test for Year 2000 compliance. It is important to specify Year 2000 compliance criteria. It will also be necessary to ensure that

the testing environment and testing tools are year 2000 compliant, as they are also susceptible to year 2000 problems. Testing organizations will have to deal with multiple environments and languages and may be unable, in many cases, to test on existing systems due to problems with licensing expiration dates and file structures. If dates are advanced, product licenses may expire which will require reloading of the effected products after obtaining the proper permissions from the vendor. Because of these problems new test environments may need to be established.

- AWARENESS PHASE - The Awareness phase consumes a much larger portion of the Year 2000 effort than usually occurs with normal development efforts. This is in large part due to the scope of the problem potentially impacting the entire organization as well as the reluctance of upper management to accept the fact they are going to have to dedicate major company resources to resolving a problem which will not add any new capability to the existing systems. There is traditionally no corresponding phase in current parametric models nor historical data on this type of development or maintenance.
- ASSESSMENT PHASE - The Assessment phase is another phase not usually in normal systems development. In normal development efforts, it is not required that an inventory of all software systems in the organization be established nor that all COTS vendors be required to show compliance of their products. Getting personnel to support obtaining this information is extremely difficult as it normally competes with their regular efforts.
- INTERFACES - Interfaces are another major concern with the Year 2000 problem. Many systems are connected to some number of other systems. This interconnectivity revolves around data that is passed and shared among systems. This is especially true of the non-AIS systems comprising the majority of the SPAWAR inventory. Another aspect of the year 2000 interface problem, is the requirement to coordinate changes to interfaces among all interfacing systems. Coordination between systems will be critical and filters,

bridges, and safety gates may have to be built at those interfaces until both systems have corrected any problems and can again exchange data that is acceptable by both systems.

Margaret Powell the DoN Year 2000 Action Officer states "Of particular concern is the synchronization of system upgrades so we do not have the disconnect when the system at one end of the interface has corrected its year 2000 problems and the system at the other end has not".

If systems do not coordinate there year 2000 interface upgrades efforts they will just be passing the problem to another system they interface with.

- LEGACY SYSTEMS - Most data processing installations contain programs in their libraries which are no longer maintained. They continue to run without problem, but cannot be modified either because no one remains with any expertise with the language, program, or in the worst case, because the source code used to create them has been lost. In a normal environment these programs can run for years if they don't need changing and don't stop working. But because of the Year 2000 issue they must be disassembled and examined to see if they contain code which operates on dates. There is no easy way to do this.
- DOCUMENTATION - The year 2000 problem, unlike normal program enhancements, requires very few documentation changes. This will reduce effort in this area of the year 2000 effort but will also make it difficult to use some of the parametric models which were based on historical projects that have required a certain amount of documentation.
- COTS - All vendors who provide the organization with software will have to be contacted about their products year 2000 compliance status and plans to bring them to compliance. This will require the procurement and integration of the various product upgrades. This also requires an organization's acquisition personnel to become involved in ensuring vendors are contractually responsible.

- ERROR INJECTION - Bad fixes are generally not taken into account in normal cost models. Year 2000 efforts are expected to introduce more bad fixes than under normal development efforts.

  According to Ref. 5 ordinary maintenance of defect repairs in the U.S. is accompanied by about a 7% defect injection rate, i.e., about 7 percent of defect repairs accidentally introduce a new defect. Year 2000 problems compound this effect because many of the programs are old and poorly documented, and written in antiquated languages with few current expert programmers. This increases this percentage to ~10%, which means that year 2000 repairs may string out for months after the first wave of initial repairs. Unfortunately bad fixes are usually not considered in year 2000 budgets and may also be left out of the contracts, which are anticipated to result in a 10% overrun. Ref. 5

- HARDWARE PURCHASES - It is expected that hardware purchases will increase to compensate for lost performance due to Year 2000 fixes. It has been predicted in the literature that Year 2000 repairs are likely to seriously impact the performance of many of the mainframe systems.

  "Estimates of performance degradation range from 10 - 35% loss in data throughput." [Ref. 5]

- This would prove to be extremely detrimental to the majority of mainframe applications. The result of this performance degradation will either be procurement of additional hardware to compensate for the loss or software optimization. Capers Jones estimates that hardware upgrades could add an additional 25 percent to the year 2000 effort. It is also expected that a large number of personnel computers will fail at the year 2000 rollover due to date problems with their BIOS. Replacement or repair of these units will also add to the hardware upgrade effort at most organizations.
- SOFTWARE OPTIMIZATION - It is expected that software efforts will be increased in order to increase system performance after changes are made to correct Year 2000 problems. It is anticipated that Year 2000 corrections will seriously impact many main frame systems that have been tuned to obtain

maximum performance from their existing hardware environment.

> "It has been estimated that this effort could add an additional 10% to the Year 2000 effort." [Ref. 5]

- TOOLS - The year 2000 problem is an extraordinarily complex, pervasive maintenance task. Without sufficient automated tool support, it is a task that will quickly become unmanageable and unnecessarily expensive, no matter how well it is managed.

> Peter de Jager states "If you're not changing code by November of 1997, you will not get this thing done on time, its that simple."

And that is based on experienced users with sophisticated tools. The start date for being able to complete this effort with average personnel and no tools was last year. Aside from their scale, the activities performed for Year 2000 migration projects are fundamentally the same as those performed for routine software maintenance. Thus the tools used for maintenance can be applied to year 2000 projects. New software tools have been created specifically to support century compliance projects. These tools are generally not reusable for routine maintenance tasks but are optimized for year 2000 tasks. Other year 2000 tools are owned by conversion vendors and are installed at their off site conversion facilities. Organizations do not use these tools directly, but receive their benefits when they out source their applications to the conversion vendor. As organizations plan their Year 2000 projects, this range of tool categories offers three distinct tool strategies: off site conversions, year 2000 specific tools, and maintenance tools. Unfortunately, most maintenance tools are not sophisticated enough to handle year 2000 maintenance on complex, mission critical systems. For example, virtually no tool support exists for some languages used in mission-critical systems, including Jovial, CMS-2, ADA, C, or C++, and dialects of assembly language. Few tools offer automated support for correction and testing, the two phases in which most errors are introduced. In the DOD environment, a deliberate emphasis on next generation language tools has been at the expense of

promoting better maintenance tools for older languages. Yet at least 80 percent of existing applications are maintained in various legacy languages for which maintenance tool support is sorely needed. The quality and level of automation for Year 2000 software tools is increasing daily. While the degree of automation will increase over the next few years, tool coverage will be restricted to the most common languages and environments. Automation covers only the most mundane portions of a year 2000 effort, i.e. code translation. Project management issues, coordination of interfaces, software package upgrades, data conversion, testing, and numerous other time consuming activities will not be automated. [Ref. 17]

IV. SPACE AND NAVAL WARFARE SYSTEM CENTER (SPAWAR) YEAR 2000 STATUS

A. SPAWAR YEAR 2000 POA&M

Until the extent of the problem is known, the operational risk DoN might encounter at the change of century is unknown. What is known is that by the year 2000, if the problem is not addressed, an undetermined number of current systems will begin to fail - some systems even earlier. Therefore, it is considered critical that the DoN execute a well thought out approach to determine the extent of the problem and cost of corrective action. The approach selected to achieve this goal is the DOD five phased approach, which has been adopted by all the services. This case study focuses on one organization within the DoN, SPAWAR, and specifically how SPAWAR is implementing the Assessment Phase of the DOD Five Phased plan.

The Assessment Phase is considered the most critical phase by Year 2000 experts because it allows management to scope the problem, develop cost estimates, assess risks and determine priorities, establish policies and procedures, and make the necessary decisions on the most viable approach to the Year 2000 resolution. The first step in the SPAWAR Assessment phase was to establish a SPAWAR Plan of Action & Milestones (POA&M) in June 1996. Because this POA&M was developed before receipt of the DOD Management Plan and the DoN Year 2000 Action Plan, it is currently being updated to be in concert with these two upper level documents. The following are milestones in support of implementing the SPAWAR Year 2000 POA&M and this thesis:

- June 1996: received SPAWAR POA&M requiring surveys of all SPAWAR systems
- July 1996: Quicklook Surveys were collected and submitted to SPAWAR, or other sponsors as applicable. Three hundred and three NRaD systems logged, 98 identified as SPAWAR systems, but not all sponsors identified so number of SPAWAR systems could have been higher
- July 1996: NCCOSC, SPAWAR's RDT&E laboratory, tried to implement

survey on the web. The Commanding Officer felt the survey was too difficult, causing undue burden on those being asked to fill it out, and asked SPAWAR to reduce the reporting requirement. SPAWAR could not comply with request as the requirements were being levied by organizations above SPAWAR

- September 1996: NCCOSC conducts Year 2000 Workshop and Tool Fair
- November 1996: Impact Surveys (updated Quicklook Survey) submitted to SPAWAR
- November 1996: SPAWAR developed the Year 2000 Assessment Checklist (Appendix. C). According to MITRE Corp., a realistic assessment of a project to determine if it is impacted by Year 2000 should take 1-2 weeks. The Assessment Checklist was intended to assist project managers in doing a preliminary, and rapid, assessment of their systems to be able to answer the data calls without having to go through the 1-2 week assessment first. Since then, the Assessment Checklist has become a mandatory report for all SPAWAR systems based on a requirement in the DOD Year 2000 Management Plan to have such a document
- January 1997: Data call from OSD/C3I requiring the number of ELOC (executable lines of code) for every SPAWAR system. The data call required that for AIS systems, a cost estimate of $1.10 for every ELOC be used and for other systems (weapon, embedded, mission critical) a cost of $8.00 for every ELOC be used
- January 1997: Based on the multiple, and constant, data calls for which the Impact Survey was inadequate, the SPAWAR Systems Inventory form (Appendix. B) was developed to collect data with which to answer the various calls without having to go back to the system project managers each time. The future intent is to have an automated version of this inventory form which project managers can keep updated at their convenience and from which SPAWAR can pull answers to most future data calls
- March 1997: Admiral Wagner, Commander of SPAWAR calls for Program

Reviews on all SPAWAR systems. Each Program Directorate (PD) was required to participate by attending the review, presenting Year 2000 status on all systems in the directorate, turning in signed Assessment Checklists and SPAWAR System Inventory forms. Two PD's accepted a SPAWAR offer to pay for half of a full 2 week assessment facilitated by MITRE.

- April 1997 to present: tracking SPAWAR Assessment Checklists and System Inventory forms
- July 25, 1997: Baseline date for data used in this thesis (Note: Author understands the dynamic nature of this SPAWAR effort and realizes that this data has changed since this baseline date)

1. SPAWAR Systems Inventory

The first major step in the SPAWAR POA&M was to compile an inventory of all computer based systems within the organization. As simple as this may sound, determining which systems were in the SPAWAR Systems Inventory proved to be extremely difficult.

The first problem was to provide a concise definition of what constitutes a system. In keeping with the philosophy of centralized management and decentralized execution, the initial approach taken by DoN was to allow each of the reporting organizations the flexibility to define what a system was composed of for their respective organization. Unfortunately this approach has produced inconsistent definitions, making comparison of data between organizations difficult. Even within an organization such as SPAWAR, obtaining and applying a concise definition of a system has proven difficult. The current definition of a system being used by SPAWAR is,

> A computer system includes all software, hardware and firmware information technology components that are operational, under development, under test, or even in the planning phase. This includes COTS, GOTS systems and components, and unfunded legacy systems which can be either a hardware-software system or a software system. A radar system is an example of a hardware-software system. A personnel or payroll system is an example of a software system.

Because of the difficulty in clearly defining what a system is composed of, fluctuations in the number of systems reported occur as products are variously included or

excluded within a system during subsequent reporting periods. This problem is compounded in the DOD with the integration of multiple systems into systems of systems. Where one system stops and another starts is not always easily defined and can be somewhat arbitrary.

The second major problem encountered was that there was no central library containing a listing of all the systems supported by the SPAWAR organization. An extensive effort was required by each of the directorates within SPAWAR to identify the various systems supported, and determine the department responsible for that system. This effort is ongoing with new systems continuing to be identified and previously identified systems being merged or separated creating new systems. This inability to identify all the systems composing the SPAWAR inventory resulted in a protracted Assessment phase. The extension of this phase will result in an increase in Year 2000 costs and a reduced time frame in which to complete the other phases of the Year 2000 effort.

2. SPAWAR Systems Assessment

Once the inventory was established, the next step was to conduct a Year 2000 impact assessment for each of those systems. In support of the Assessment phase, two separate forms were provided to each of the systems project managers: the Year 2000 Assessment Checklist and the SPAWAR Systems Inventory (sometimes referred to as the SPAWAR Questionnaire). The Year 2000 Assessment Checklist was designed to be a "thought provoker" for development and maintenance personnel to use in their initial assessment of a systems year 2000 compliance. A sample Year 2000 Assessment Checklist is provided in Appendix C. The SPAWAR Systems Inventory (Appendix B) was the result of a detailed survey of the current literature and web sites dealing with this type of activity and a compilation of all data requested to be reported to date. The SPAWAR Systems Inventory was designed to 1) provide a single data call that the projects could respond to and update that would answer the many requests for information that were coming to the projects at an ever increasing pace and 2) provide information on Year 2000 costing parameters that could be used for this thesis and by others for later analysis. This inventory form was distributed along with a Year 2000

Assessment Checklist to each of the program managers within SPAWAR, who then distributed them to each of their project managers. The completed forms were then to be returned and the data entered into a SPAWAR database with a subset of the information going into the DOD designated Year 2000 database. This information was tracked and status provided to upper management several times a month. SPAWAR Year 2000 status is provided in Appendix D.

The initial SPAWAR Year 2000 status review was held in March 1997, with upper management, to determine the Year 2000 status of the SPAWAR organization. This status is updated on a quarterly basis.

a. SPAWAR Systems Year 2000 Reporting Status

The current status of the effort for each of the reporting systems is shown in Figure 3. The data presented in Figure 3 is current as of July 25, 1997, the baseline date for this thesis. (Note: Much activity continues within SPAWAR and statistics presented in this thesis are changing continually) As Figure 3 shows, 10% of the systems have not completed assessments, this phase was scheduled for completion in June 1997. Another 15% of the systems have not turned in signed Year 2000 Assessment Checklists. These checklists were to be signed by each of the systems project managers indicating that they had completed the items on the Year 2000 checklist and that the information was accurate. 13% of the systems have not submitted the detailed SPAWAR Systems Inventory forms. A major problem in this phase was the difficulty in getting the forms completed and returned even though mandated. The SPAWAR office collecting the data was viewed as the problem and the proverbial "shoot the messenger" scenario ensued. Getting timely, complete and reliable responses from the projects has been one of the most time consuming and difficult parts of the Assessment effort so far. Figure 4 shows the timeline of responses for the requested Year 2000 data from each of the program directorates. This data was originally requested in March 1997, and this phase has still not been completed. The data illustrates the slow return of the surveys and questionnaires which has prolonged the assessment phase and made it difficult for upper management to get a handle on the scope of the Year 2000 problem. In addition to the difficulty identifying the systems in the inventory, there has been a reluctance to take this problem

seriously. Many program/project managers do not fully understand all the possible implications of the Year 2000 problem and therefore have been quick to state that their projects have no Year 2000 problem. This is partially due to the fact that the Year 2000 effort within the organization is unfunded causing any year 2000 expenditures to come out of project resources that are currently allocated for other efforts. Until the DOD determines that this is a problem sufficient enough to warrant additional funding, schedule relief, or reduction of requirements, we will continue to receive data that is of questionable quality. As shown in Figure 3, 160 systems have been identified within the SPAWAR organization. As indicated, this number has been changing constantly as new systems are entered and old systems are determined to be composed of multiple systems.

	Total Systems	Assessment Not Complete	Signed Checklists Needed	Inventory Forms Needed
NRaD	2	2	2	2
PD13	3	0	0	0
PMW-151	27	0	6	1
PMW-152	9	0	0	0
PMW-161	2	0	0	0
PMW-162	2	0	0	0
PMW-163	11	0	0	0
PMW-171	5	0	0	0
PMW-173	15	0	0	0
PMW-176	48	7	20	6
PMW-181	3	1	1	1
PMW-182	2	0	0	0
PMW-183	1	0	0	0
PMW-185	3	1	0	1
PMW-187	16	7	2	2
PEO-SCS	8	0	0	1
SPAWAR	3	0	2	2
05/07 Totals	160	18	33	16

Figure 3. SPAWAR System Inventory Response Status

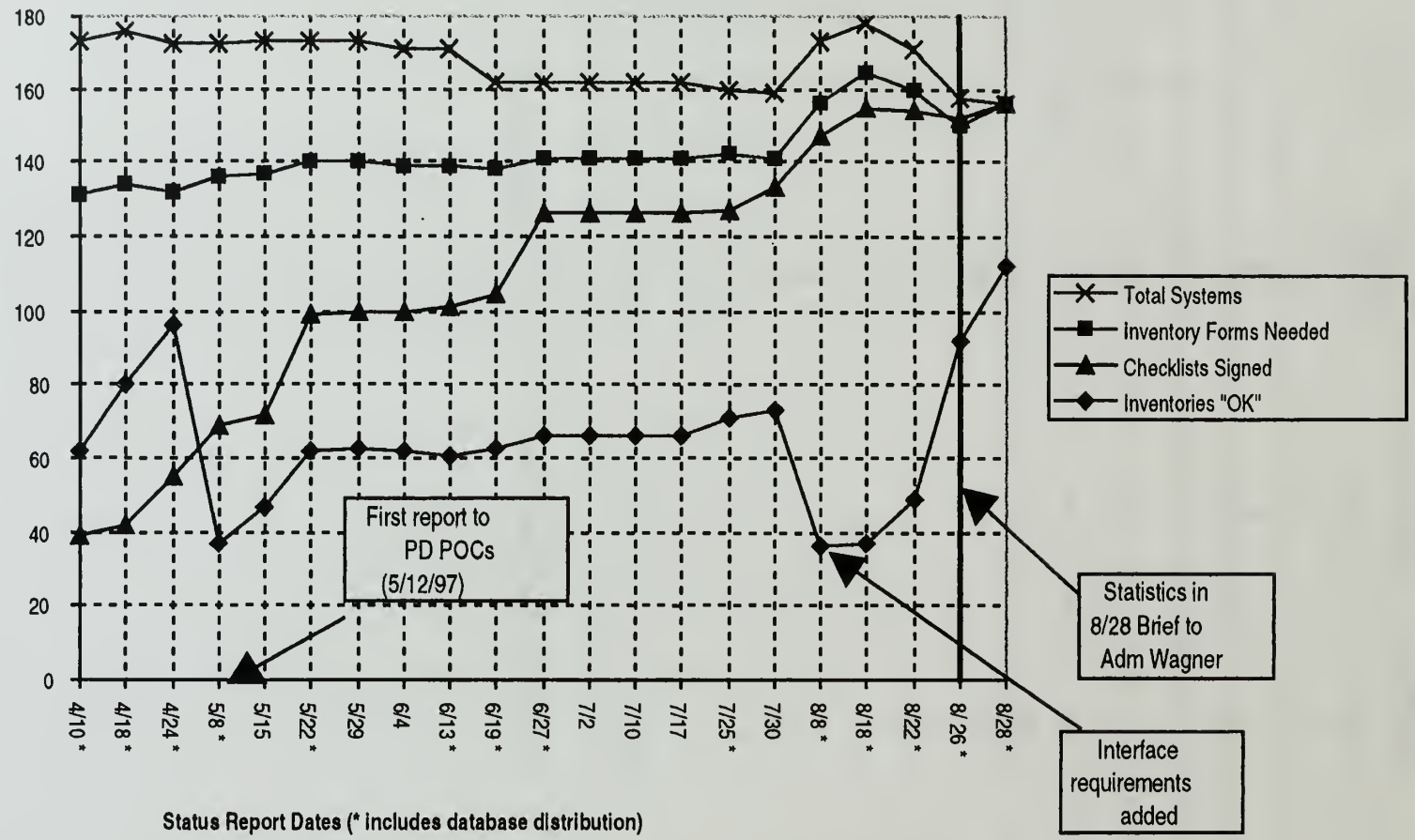

Figure 4. SPAWAR Year 2000 Reporting History

b. SPAWAR Systems Year 2000 Problem Status

Figure 5 SPAWAR Y2K Problem Status, shows the current data regarding the year 2000 status of the SPAWAR systems.

- Status Code A "No Y2K Problem", shows the number of systems reporting that they have no Year 2000 problem. There has been a slight decrease in the number of systems reporting this status. This figure compares the data from the last data call and this the most recent. Currently approximately 25% of the systems are reporting no Year 2000 problem.
- Status code B "Fix In Place", indicates that few of the systems have actually had time to implement Year 2000 corrective changes into their systems. This value will obviously increase as more systems complete maintenance efforts.
- Status Codes C "Fix in Next Release", has increased significantly as more systems have determined they have Year 2000 problems and are factoring this in to their upgrade schedule.
- Status Code D "Fix In Development" has also increased dramatically, again due to the fact that programs have identified year 2000 problems and because of the increased priority by upper management
- Status Code E " Will Fix Before Y2K" this value has decreased, as program managers have had more time to evaluate their options, decisions are being made to incorporate fixes into current development efforts, or not to fix, but retire the system.
- Status Code F "Dependent on TOOLS", none of the systems reported that their Year 2000 effort was dependent on tool availability.

	Status code	14 Mar 1997	25 Jul 1997
A	= No Problem	53	51
B	= Fix already in place	0	1
C	= Fix in next release	12	16
D	= Fix under development	1	10
E	= Will fix before 2000	34	21
F	= Fix dependent on tools	0	0
G	= Fix dependent on COTS	3	14
H	= Will not fix problems	0	2
I	= Terminates before 2000	6	7
J	= Assessment not complete	24	18
K	= Under acquisition/ development	0	20
	Total	133	160

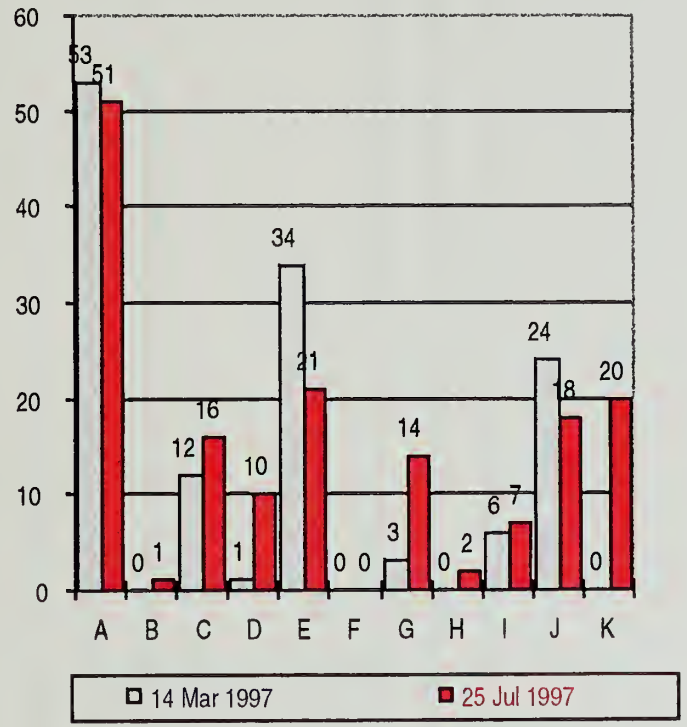

Figure 5. SPAWAR Y2K Problem Status

- Status Code G "Dependent on COTS", systems reporting this status have increased significantly. This is a result of the realization that COTS products are not exempt from this problem. The number of systems with a status code indicating their Year 2000 fix is dependent on COTS should continue to rise as more vendors/users identify problems with the various COTS products. Vendors have been reluctant to provide this information. Vendors are also very reluctant to certify that their products are Year 2000 compliant due to litigation issues making it very difficult to determine if their products are in fact Year 2000 compliant.
- Status Code H "Will Not Fix", the number of systems reporting this status has increased slightly. As program managers evaluate their options more systems may choose this option, because the window during which the problem will occur is minimal and there are acceptable workarounds.
- Status Code I "To be Terminated", systems reporting this status have increased slightly. This value may increase as more project managers determine the magnitude of the Year 2000 effort and other options become cost effective.
- Status Code J "Under Assessment", systems reporting this status continue to decrease but at a slow rate. This is a problem as these systems have not completed assessment prior to the June 1997 date for completion of this phase.
- Status Code K "Acquisition/Development", systems reporting this status has increased significantly. This was because this was a recently created category created to accommodate these systems.

c. SPAWAR Systems Year 2000 Phase Status

Figure 6 "SPAWAR Systems by Phase" shows the current status of the SPAWAR systems by phase. All systems within the organization have moved out of the Awareness phase. Seventeen systems are currently in the assessment phase which according to the current SPAWAR POA&M should have been completed by June 1997. Eighty seven systems are currently in the Renovation phase. One system is currently in the Validation phase and sixty eight systems are in the Implementation phase (Note: the Implementation phase includes status codes A, B, H, and I). It is

significant that only one system is in the validation phase. It may indicate a lack of understanding of the testing required for Year 2000 and also the difficulty establishing test environments for Year 2000 testing, which may become a growing issue as more systems approach this phase.

Phase	
Awareness	0
Assessment	18
Renovation	81
Validation	0
Implementation	61
Total	160

As of July 25, 1997

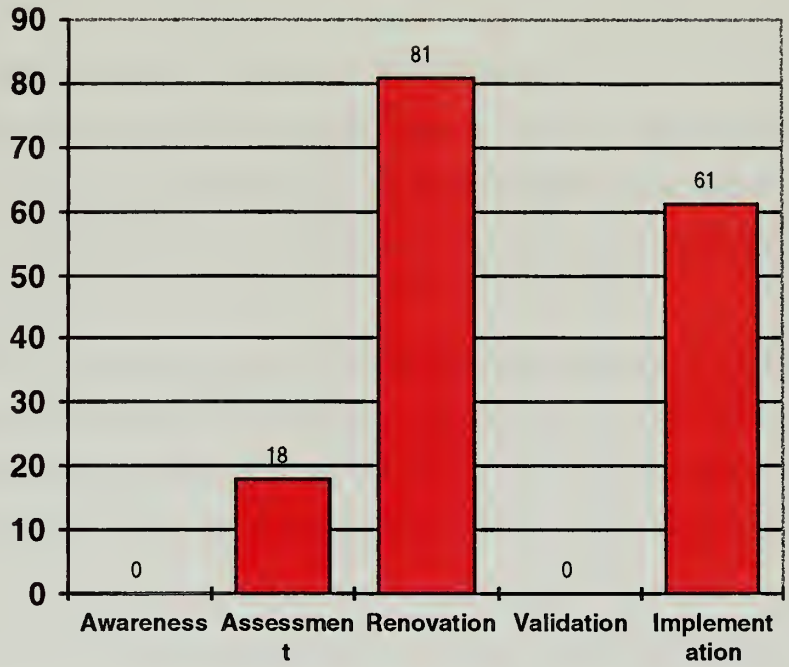

Figure 6. SPAWAR Systems by Phase

d. SPAWAR Systems Inventory Results

The following are fields included in the SPAWAR System Inventory because of their potential impact on Year 2000 costs. SPAWAR System Inventory results are provided in Appendix E. (Note: the following data is based on 151 systems responding to these questions on the SPAWAR Systems Inventory form. Not all systems responded to all questions.)

- B4 Software Package Vendor - The survey listed 43 different software package vendors. The greater the number of vendors the greater the costs associated with having to assess each vendors package for compliance. If vendors are found to be non compliant, then

having to deal with multiple vendors can create higher procurement costs. Finding and procuring new compliant vendor packages and/or design and implement a work around increases people and time resources.

- B5 Software Package Upgrade - Is a software package upgrade required for Year 2000? 66 systems responded no, 46 responded yes. Upgrading software packages will effect a large number of SPAWAR systems and increase Year 2000 costs. Contingency plans in case upgrade is not available in time are required.
- B7 Programming Language - Very few of the SPAWAR systems are written in COBOL or any of the other languages for which the majority of Year 2000 tools have been developed. Because of this, there will be a greater dependence on manual efforts to find and fix Year 2000 problems. This will increase the Year 2000 costs for the organization and may prolong each of the different phases.
- B8 Compiler Availability - 108 systems reported compilers were available, 9 systems reported compilers were not available. The majority of the SPAWAR systems have compilers available which should reduce the Year 2000 effort. For those systems lacking compilers further analysis should be done to determine systems criticality and compliance options.
- B14 Documentation - Is requirements and design documentation available? 93 systems reported documentation is available, 18 reported documentation was not available. The majority of systems indicated they have documentation available which should reduce the overall cost of SPAWAR Year 2000 compliance. Those systems not having documentation available will have a higher Year 2000 costs because this will increase the difficulty in understanding and analyzing the system for year 2000 problems.
- B15 Source Code Availability - 106 systems reported source code was available, with 14 reporting source code would not be available. Not having source code available will seriously impact a systems options in dealing with Year 2000 problems. Without the source code you will not be able to go in and analyze and correct the code. You must then either come up with a method to recreate the code or create solutions external to the system. The majority of SPAWAR systems have the source code available which will reduce the overall

Year 2000 costs. Those systems lacking source code will have to be further analyzed to determine which options are available and most appropriate. This could potentially increase Year 2000 costs for these systems.

- B17 Date Formats - Over 90% of the systems reported high or medium consistency within the system of a standard date format. This should reduce the effort required to find and correct Year 2000 problems in these systems. This should reduce the overall Year 2000 costs.
- B19 Two-digit year problem - 66 systems reported having this problem, 49 did not have this problem. Systems will have to make decision as to which option is most appropriate for their situation i.e. sliding window, four digit year etc.
- B20 Six-digit date problem - 39 systems reported having this problem, 76 did not have this problem. Systems will have to make decision as to which option is most appropriate for their situation i.e. sliding window, four digit year etc.
- B21 Leap year errors - 17 systems reported having this problem, 101 did not have this problem. This is a minor change which should not seriously impact year 2000 cost.
- B22 Inaccurate data calculations - 38 systems reported having this problem, 83 did not have this problem. It is difficult to find all the instances of this problem. This will increase analysis and testing efforts and require multiple cycles to resolve all instances. This problem will increase the overall Year 2000 costs for these systems.
- B23 On-Line screen changes - 37 systems reported having this problem, 82 did not have this problem. Systems will have to make decision as to which option is most appropriate for their situation. If room is available on the screen these changes could be minor. If room is not available on the screen more creative solutions will be required that will increase costs.
- B24 Report form changes - 30 systems reported having this problem, 87 did not have this problem. Systems will have to make decision as to which option is most appropriate for their situation. If room is available on the report these changes could be minor. If room is not available on the report more creative solutions will be required that will increase costs.
- B26 Operating System Vendors - The systems reported 24 different operating system vendors. This will increase the overall Year 2000 cost due to the fact multiple vendors must

be assessed for compliance and if problems are found multiple solutions must be dealt with.

- B27 Operating System Upgrade - 38 systems reported having to upgrade their operating systems, 62 did not having to upgrade their operating systems. This will significantly increase the overall Year 2000 cost for these systems. Integrating new operating systems can be quite time consuming, depending on the solutions provided by the vendors.
- B34 DBMS Upgrade - 4 systems reported having this problem, 48 did not have this problem. The majority of the SPAWAR systems did not require this effort so this should not be a major cost driver.
- D5 Hardware Manufacturer - The survey listed 46 different hardware package vendors. The greater the number of vendors the greater the costs associated with having to assess each vendor's package for compliance. If vendors are found to be non compliant, then having to deal with multiple vendors can create higher procurement costs.
- D6 Hardware Upgrade - 8 systems reported requiring a hardware upgrade, 100 systems did not require a hardware upgrade. The majority of the SPAWAR systems did not require this effort so this should not be a major cost driver.
- D8 BIOS Compliance - 72 systems reported BIOS compliance, 14 systems reported not being BIOS compliant. The majority of the SPAWAR systems did not require this effort so this should not be a major cost driver.
- E4 Y2K Hardware Platform Compliance - 87 systems reported that their hardware was Y2K compliant, 7 systems reported non-compliance. The majority of the SPAWAR systems did not require this effort so this should not be a major cost driver.
- E5 Y2K Operating System Compliance - 64 systems reported compliance, 27 systems reported non-compliance. This will significantly increase the overall Year 2000 cost for these systems. Integrating new operating systems can be quite time consuming, depending on the solutions provided by the vendors.
- E6 Y2K System Application Compliance - 61 systems reported compliance, 29 systems reported non-compliance. Depending on the degree of non-compliance and the solution option selected this will increase the overall Year 2000 cost for these systems.
- E7 Sort Routine Compliance - 59 systems reported compliance, 12 systems reported non-

compliance. Depending on the degree of non-compliance and the solution option selected this will increase the overall Year 2000 cost for these systems.

- E8 Backup Routine Compliance - 60 systems reported compliance, 8 systems reported non-compliance. This does not appear to be a major cost driver for the overall Year 2000 cost for these systems.
- E9 Archival Routine Compliance - 52 systems reported compliance, 6 systems reported non-compliance. This does not appear to be a major cost driver for the overall Year 2000 cost for these systems.
- F3 Field Expansion - 30 systems will use this option to correct their year 2000 problem, 24 systems will not. Expanding the date field is a time consuming effort which could also impact interfacing systems. This will increase the overall Year 2000 cost for these systems.
- F4 Procedural Code - 31 systems will use this option to correct their year 2000 problem, 22 systems will not. Using the procedural code option reduces the amount of effort required in correcting the Year 2000 problem because it limits the amount of change required to the code and databases. This will decrease the overall Year 2000 cost for these systems.
- F5 Sliding Window - 12 systems will use this option to correct their year 2000 problem, 40 systems will not. Using the sliding window option reduces the amount of effort required in correcting the Year 2000 problem because it reduces the amount of change required to code and databases. This will decrease the overall Year 2000 cost for these systems.
- F7 Tools to Find Y2K Problems - 25 systems will use tools to find Year 2000 problems, 30 systems will not. Using tools reduces the amount of effort required in finding the Year 2000 problem. This will decrease the overall Year 2000 cost for these systems. Because 30 systems are not using tools this will increase the SPAWAR overall Year 2000 costs.
- F8 Tools to Fix Y2K Problems - 8 systems will use this tools to fix Year 2000 problems, 45 systems will not. Using tools reduces the amount of effort required in fixing the Year 2000 problem. This will increase the overall Year 2000 cost for these systems. Because only 8 systems are using tools this could increase the SPAWAR overall Year 2000 costs.
- F9 Development Tool Availability - 42 systems will use this tools to assist in the Year 2000 effort, 8 systems will not. Using tools generally reduces the amount of effort required

in resolving the Year 2000 problem. This will decrease the overall Year 2000 cost for these systems.

- F10 Application Expertise - 47 systems reported high levels of expertise, 10 systems reported medium levels of expertise, and 1 systems reported low levels of expertise. High levels of application expertise will decrease the effort required to find and fix year 2000 problems. This will decrease the overall Year 2000 cost for these systems.
- F11 Language Expertise - 55 systems reported high levels of expertise, 3 systems reported medium levels of expertise, and 0 systems reported low levels of expertise. High levels of language expertise will decrease the effort required to find and fix year 2000 problems. This will decrease the overall Year 2000 cost for these systems.
- F12 Special Upgrade - 12 systems reported that they would require a special software upgrade to correct Year 2000 problems outside of their normal upgrade schedule, 42 systems reported that a special software upgrade would not be required. For those systems requiring a special software upgrade this could significantly increase the overall cost of Year 2000. For those systems that are able to incorporate the Year 2000 changes into a normal upgrade cycle the costs will be considerably less.
- F14 Technical Risk - 6 systems reported high levels of risk, 14 systems reported medium levels of risk, and 37 systems reported low levels of risk. The majority the systems reported low to medium risk levels, this will tend to decrease the overall Year 2000 cost for these systems.
- F15 Funding Resources Risk - 15 systems reported poor availability of funding, 19 systems reported moderate availability of funding, and 15 systems reported adequate availability of funding. Inadequate funding will seriously impact the Year 2000 risk. A large number of systems reported poor to moderate availability of funding, this will tend to increase the overall Year 2000 risk for these systems because it will reduce the level of effort on these systems which will extend the phases and impact the ability of these systems to complete this effort prior to Year 2000.
- F16 People Resource Risk - 12 systems reported poor availability of personnel resources, 13 systems reported moderate availability of personnel resources, and 31 systems reported

adequate availability of personnel resources. Inadequate personnel resources will seriously impact the Year 2000 risk. Approximately half of the systems reported poor to moderate availability of personnel resources. This will increase the overall Year 2000 risk for these systems.

- F17 Facilities Resources Risk - 9 systems reported poor availability of facility resources, 14 systems reported moderate availability of facility resources, and 33 systems reported adequate availability of facility resources. Inadequate facility resources will seriously impact the Year 2000 risk. Twenty three systems reported poor to moderate availability of personnel resources. This will increase the overall Year 2000 risk for these systems.

This data indicates that the SPAWAR systems are impacted by the same Year 2000 problems that private industry has been. In addition to these cost drivers, DOD systems also have some unique drivers such as complex interfaces and highly integrated systems.

e. SPAWAR Systems Year 2000 Cost Estimate

Figure 7 shows the current SPAWAR Year 2000 cost estimates provided to the DoN. Using a modified DOD model for cost estimation the SPAWAR organization estimates that its Year 2000 impact at $130M. This estimate did not include those systems that reported they had no Year 2000 problem. If SPAWAR had followed the DOD cost estimation model and just determined total lines of executable code for all systems and multiplied this value times the appropriate cost factor, they would have had a higher Year 2000 cost. Approximately 30% of the SPAWAR systems reported no Year 2000 problem. So a rough cost estimate would have been 30% higher. A second cost estimate using various cost estimating models produced an estimate of 15M to resolve SPAWAR Year 2000 problems. The wide variance in the cost estimates has created confusion for upper management trying to get a handle on the scope of this problem.

In the SPAWAR case study it was apparent that a more refined cost estimate was required to provide meaningful year 2000 cost estimates to upper management. A significant problem with trying to estimate the cost of a year 2000 effort is that cost estimation has traditionally relied on historical data from similar projects or parametric models developed to account for the various cost factors involved in a development effort. As discussed in Chapter 4, year 2000 cost estimation has a

number of unique cost factors which render existing parametric models less applicable than they are for traditional software development or maintenance efforts and historical data non-existent. Although the Year 2000 problem is similar to other software problems, it has some major nuances that make it more than a standard maintenance problem. The DOD has initially adopted a high level approach ($1.10 x ELOC for AIS and $8.00 x ELOC for Others) to estimating the Year 2000 costs. While this approach has forced consistency between projects and across organizations and provided Congress and management a high level look at the impact of the Year 2000 effort, it is now necessary to provide a more accurate estimate so that managers can more accurately plan for funding and resource allocation.

As Emmet Paige (OSD/C3I) stated in his memo of 14 January 1997, "Once a rough work year estimate has been obtained, it is time to begin an in-depth analysis of the costs associated with solving the Year 2000 problem."

ESTIMATING THE YEAR 2000 PROBLEM

As of 27 June 1997

- **Other Costing Methods:**

  - PMs using existing cost models
  - 160 Systems

Total Cost = $99 million

- **Generic Algorithm:**

  - AIS = $1.10 x LOC
  - Embedded = $8.00 x LOC

	AIS	EMBEDDED
LOC	35,414,229	11,454,832
COST	$38,955,652	$91,638,653

***Total Cost = $130 million**

*does not include LOC for 55 systems that did not report LOC, this is ~1/3 of the systems so that value could be significantly higher depending on the LOC of these systems

Figure 7. SPAWAR Year 2000 Cost Estimate

Gross budget estimates, based on lines of code, suffice as a way to gain high level awareness, but if these statistics are used beyond this early planning phase the risk of measuring the project against unrealistic numbers increases. Actual Year 2000 costs must evolve through the various phases of the effort. In the SPAWAR case study it became quite apparent that the current costs must be refined. As shown in Figure 7, the estimated year 2000 cost ranges from 130M using the ELOC method recommended by the DOD and 99M using other methods.

> Bruce Hall of the Gartner Group, Inc. testified before the congressional subcommittee on March 20, 1997, The year 2000 project can be likened to an old house that needs remodeling. We know it is a big job and we are trying to figure out how much it will cost and how long it will take. But, we are trying to predict the cost of the job while standing on the curb across the street. If we were able to walk through the house, our estimate would be more accurate, and only by getting in and actually doing some of the work can we realistically tell what we are up against. And, as usual. The contractor thinks the job will cost more than the homeowner thinks it should.[Ref. 2]

It has become apparent from looking at the data collected during this case study that in addition to getting off the curb and into the house we also have to adapt our cost estimation methodology to include the unique aspects of remodeling an old, a vintage, house, AKA the Year 2000 effort.

The SPAWAR systems were generally assessed without the use of automated tools to assist in their Year 2000 assessments. The assessments were based on system expert analysis and in some cases, testing by turning the clock ahead to Year 2000 and observing the effect on the system. As outlined in Chapter IV there are a number of unique cost drivers that will impact the cost of Year 2000 compliance. The DOD has devoted a significant amount of time attempting to determine exactly how much the year 2000 compliance effort will cost. Determining the exact cost of a year 2000 effort will be difficult without previous data or models. From this case study it was apparent that these models must take into account these unique year 2000 cost drivers. One approach that is currently in the literature that would provide more refined costing information yet not devote an inordinate amount of time to estimating Year 2000 cost is the use of assessment data that lists the instances of dates in a systems code combined with the year 2000 unique cost factors to estimate Year 2000 costs. Using this approach a manager must:

- determine the executable source lines of code (ELOC) for legacy systems
- determine the size of s/w databases

- determine the incidence of date references in applications
- determine the incidence of date references in current databases
- estimate the effort to repair each date reference
- estimate the effort to test and validate each date reference
- estimate the error injection rate
- estimate tool procurement costs
- estimate hardware procurement costs
- estimate COTS upgrade procurement costs
- estimate infracture repair/replacement cost
- estimate impact on interfaces with external systems

This approach will help refine the current cost estimates that currently do not take into account the amount of date related code within a system nor the year 2000 unique cost factors. Systems that do not deal extensively with dates would have a proportionately lower cost estimate than systems that do. As I indicated determining the exact cost of a Year 2000 effort will be extremely difficult without previous data or models. One approach would be to use a methodology similar to the one cited above, calibrated with the year 2000 cost factors, to achieve a more accurate rough estimate that will likely err on the high side than get on with the effort of correcting the problem.

B. SUMMARY

The Assessment Phase is considered one of the most critical phases of a year 2000 effort. An important aspect of the SPAWAR Year 2000 effort that was brought out during this during this case study is the large amount of time and effort required during the assessment phase and the uncertainty of the data collected. It is therefore critical that an organization attempt to streamline this phase and ensure that the information collected is reliable so that plans and resources can be developed and allocated for the remainder of the year 2000 effort. The Assessment phase is one of the unique aspects of a Year 2000 effort and because of the pervasive and insidious nature of the Year 2000 problem every system in an organizations library must be assessed for compliance. The following are the lessons learned during the SPAWAR case study.

- Strong upper level management support and monitoring of the effort is critical. As with any major project, strong upper level management support is essential to the projects success. This is especially true with a year 2000 effort which has often been considered to be more of a management challenge than a technical one.
- Creation of Year 2000 Office - It is important for an organization to create a year 2000 project office and team as soon as they begin their year 2000 effort. This group will become the year 2000 experts in the organization and the central repository for all year 2000 data and information. This group should be staffed with "top performers" within the organization. This team will be asked to provide a wide variety of technical services, and the better they are, the smaller the impact will be on project personnel and the smoother this complicated process will proceed. Its the adage "pay now or pay later" unfortunately there is little time for latter when addressing the Y2K problem. It can not be over emphasized that anything you can do to expedite this process and reduce duplication of effort is worth looking into. Some of the tasks this group will need to initiate immediately are:

- establish an organization year 2000 Web page
- establish a year 2000 systems reporting database
- establish year 2000 compliance criteria
- determine COTS year 2000 compliance

- determine H/W year 2000 compliance
- Year 2000 tools
    - evaluate tools
    - coordinate tool procurement
    - provide tool recommendations/training/support
- support assessments
- establish year 2000 test cases sample
- Reduce duplication of effort - It is critical that duplication of effort be reduced to a minimum. The Y2K team should be the center for all Y2K information. The better this office performs the more you can minimize the impact on your project personnel. If each project does not have to contact vendors to determine compliance, evaluate tools etc. it is valuable time that can be spent on other efforts or in resolving the year 2000 problem. This approach will also provide consistency throughout the organization.
- Initiate Awareness program - Initiate a year 2000 awareness program within the organization. This should involve training and regular status and information updates.
- Systems Inventory - Initiate an organization wide systems inventory. It is critical that all systems, COTS, GOTS, etc. are identified as early as possible. This is what your assessment will be based on and without an accurate accounting of the systems in the organization the Assessment phase will flounder. The earlier this effort is started the better. As was observed in the SPAWAR case study this effort can take an inordinate amount of time if allowed to, and will impact the succeeding phases.
- Year 2000 POA&M - Develop a year 2000 POA&M, starting from the back and working forward. Determine the latest date you can complete implementation and still have sufficient time to observe the systems performance in an operational environment and still have time to resolve any problems found prior to the year 2000. Then work forward from that date allocating time for each of the respective phases. It will quickly become obvious that you will not have excess time in any of the phases, so anything you can do to expedite these tasks and reduce duplication of effort the more time you will have to deal with the problem. The plan must include hard dates for the completion of each phase and

intermediate reviews to expedite these efforts and identify problems early on.

- Visibility - It is important that upper management give this issue high visibility, with frequent status reviews and incentives. The organization needs to realize this is an important issue that is not going away. The year 2000 team needs to maintain year 2000 visibility through the Web page, email, memo's, and other appropriate media. As we have seen in our case study projects tend to focus on the immediate task at hand and that is normally the funded one. When year 2000 reviews are scheduled then effort will shift to the year 2000. This level of effort needs to be maintained if the year 2000 effort is to be successful, though it may be at the cost of other priorities. Upper management must allow relief with the other tasking if the expect to get meaningful support for the year 2000 effort.
- Top Priority - The year 2000 problem needs to be made a top priority with clear direction on priority conflicts. Upper management needs to establish year 2000 as one of its top priorities and reinforce this throughout the organization.
- Funded - The year 2000 effort needs to be a funded effort, and directed as separate tasking. This way managers can allocate resources to work on this effort and not have to borrow somebody from another effort every time they receive another data call. The initial approach in the DON has been to add it to the current tasking without additional funding or schedule relief for the other work being done. This impacts the ability of projects to dedicate the resources this problem requires to provide accurate data that can be used by upper management for planning and resource allocation.
- Cost Estimation - The final product of the Assessment Phase should be a revised year 2000 cost estimate. Cost estimation for Year 2000 is an evolutionary process. The initial cost-per-line of code estimates were sufficient for providing general estimates during the early stages of the budgeting processes but are not sufficient for allocating resources and refined budgeting requirements. Year 2000 cost estimates must evolve through the various phases of a year 2000 effort as more information becomes available. During the Assessment phase the projects will have completed their assessment efforts and can use that data as input into a parametric or other cost model to calculate a revised year 2000 estimate. From the SPAWAR case study it was found that the parametric cost estimation models needed to be calibrated to take into account the unique cost factors involved in a year 2000 effort. It is

important to identify the cost estimation tools and methodology to be used throughout each of the DOD defined phases of a year 2000 effort. This is important so that the appropriate data can be collected during the various phases for input into the cost model. If the required data is identified early on it is usually easier to collect while certain activities are going on rather than have to go back and recreate it or have a separate effort collect the data. It is also very important that whatever cost estimation model is chosen it is calibrated using the unique year 2000 cost factors identified in Chapter IV of this case study. These cost factors should be evaluated to determine their application to an organizations particular year 2000 efforts.

APPENDIX A

YEAR 2000 COST FACTORS CHECKLIST

Provided by Mr. Bob Molter, ASD/C3I

NOTE: Year 2000 "compliancy" includes proper processing of Leap Years [The Year 2000 is a Leap Year]

Application Software:

___ Size: Number of executable lines of code (LOC)

___ Age: Older code tends to be less structured and thus harder to understand

___ Complexity: Relative intricateness/understandability of the business rules

___ Documentation: Degree of documentation available and its understandability

___ Programmer: Familiarity with the program code. Level of skill/competency/expertise

___ Source Code: Availability

___ Date- "Intensiveness": Relative number of date related calculations/comparisons

___ Embedded Dates: Frequency of date use as part of data element or in data element codes

___ Date Formats Used: Consistency within the system of a standard date format

___ Year 2000 Strategy (Field expansion/procedural code/sliding window): Different strategies to achieve Year 2000 "compliancy" have different costs

___ Language: Some languages (e.g., COBOL 68) are unable to properly process the Year 2000 so the software will have to be upgraded/changed. Additionally, the language relates to the availability of the Year 2000 COTS tools, programmers to work on the system, and availability of Year 2000 compliant COTS]

Hardware/System Software: Year 2000 compliancy of each of the components of the technical environment is required. [Often only a current version of a product will be Year 2000 compliant.]

___ Operating System

___ Major Subsystems: Sometimes subsystems have different technical environment components

___ Database Management System (DBMS)

___ Compilers/cross-assemblers (available -- sometimes they don't exist)

___ Teleprocessing (TP) monitors

___ Homegrown/locally developed software that is used in conjunction with the system

___ Workstation Software: Consider the quantity needed

___ Workstation BIOS (handles the "system clock function"): 60-80% of PC BIOSs are not Year 2000 compliant -- most are soldered to the motherboard, some are re-programmable, some are "socketed" and some can be replaced

___ Programmer: Familiarity with the hardware and operating system. Level of skill/competency/expertise

___ Programmer System Software (utilities and development tools): To support making changes to the software

___ Capacity/Usage Level: Making a system Year 2000 compliant may increase storage (DASD) requirements or even CPU requirements and cause a need to purchase a larger computer or more DASD

___ Embedded Software (microchips/circuit cards; e.g., PABXs, security system (access control), cash registers): They may be directly or indirectly related to a system, and may not be Year 2000 compliant. The availability of compliant hardware or the cost of developing, and the quantity required must be considered

___ Communications: Telecommunications hardware and software upon which the system depends must be considered

___ Network Timestamps (LAN/WAN network clock time): Upon which the system is dependent

Database/Files:

___ Number of date-related data elements

___ Amount of available DASD

Year 2000 Tool Support:

___ Availability: Many languages and/or technical environments do not have Year 2000 COTS tools so tools must be developed in-house or specifically contracted for development

___ Quality

External Interfaces/Middleware:

___ Data Sources: Must be evaluated and "bridges" planned as required

___ Data Outputs: Must be evaluated and "bridges" planned as required

___ EDI Transaction Sets: System may generate some EDI transactions or get input from EDI transactions which require "bridges"

___ Reports: Systems may generate paper reports which need to be modified

___ Screens: Systems may have screens used by users which require modification

System Plans:

___ Planned Major Upgrade: May be used to do Year 2000 compliance work at the same time to reduce costs

___ Termination: System may be eliminated before a Year 2000 problem occurs

___ Replacement: System is planned for COTS replacement or re-engineering before impacted by the Year 2000

Miscellaneous System-Related Information:

___ Sort Routine Year 2000 compliancy

___ Backup Routine Year 2000 compliancy

___ Archival Routine Year 2000 compliancy

___ System Criticality/Priority: Really not required for cost estimate, but a good time to record this critical planning information

___ Risk Analysis (if system fails): Really not required for cost estimate, but a good time to record this critical planning information. Consequences of system failure must be considered

___ Risk Analysis (if system is not made Year 2000 compliant): Many systems only have a small "window of vulnerability" during which not being able to process Year 2000 properly occurs.

Consideration must be given to whether or not this "window" is acceptable; i.e., the system won't be used during that period, or a "workaround" will be established for that period; e.g., manual processing.

___ Contingency and Continuity of Operations Planning

Year 2000 Management:

___ Project Management

___ Configuration Management

___ Change Management

___ Contract(or) Management

___ Year 2000 Emergency Reaction Team

Year 2000 Testing:

___ Establishing Test Environment

___ Unit Testing

___ Integrated Testing

___ Year 2000 Simulation Testing: Can sometimes require mirror of production environment. Might not be possible until technical environment is made Year 2000 compliant.

APPENDIX B

SPAWAR SYSTEM INVENTORY FORM

SPAWAR System Inventory Contents

Field Number	D = DIST Reqt.	O = OMB Reqt.	C = Congress(Horn)	N = NISMC Reqt.	S = SPAWAR Reqt	P = OSD/C3I Reqt	M = Model Calib.	FIELD IDENTIFIER	DEFINITION	EXAMPLE	YOUR SYSTEM
								Part A: System Identification			
A1	D	O	C	N	S	P	M	System Name	System Name. Equals DIST's "Application Name." Note that a "System" may be part of a larger "Program" identified below, and also subdivided into multiple subsystems or "Software Packages," also identified below.	Joint Maritime Command Information System - Ashore Component	_____
A2	D				S			Acronym	A shortened or commonly used name for the system	JMCIS-Ashore	_____
A3								Parent System/Program	Name of superior System level or Program name, if any.	JMCIS	_____
								Latest Update	Date data for this system was last updated	6/13/1992	(automatically assigned)
								DIST Number	Defense Integration Support Tool (DIST) System Identification Number	99000331	(assigned by DIST)
A4	D							Description	Short Description of System's Mission and Functions	Ashore component of the JMCIS common operating environment (COE)	_____
A5	D							System Mission	DoD mission supported by the system. Pick from: Command and Control, Intelligence, Mission Support or Other Missions. See "List A." Multiple entries possible.	Command and Control	_____
A6	D						M	System Function	The function supported by the system. Select from "List A," depending on Mission above. Multiple entries possible.	Maritime Operation	_____
A7	D							System Activity	The activity supported by an application. Select from "List A," depending on Function above. Multiple entries possible.	Joint Strategic Sealift	_____
								Part B: Software Package Information (multiple entries possible)			
B1	*							Software Package Type	Application software components (except Operating System, DBMS, or network software identified below) - select: User Interface Package, Software Security Package, Graphics, Data Dictionary, or Case Tool.	User Interface	_____

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B2	D							Software Package Name	The full name of the specific item of software	JMCIS Application Program	_____
B3	D							Software Package Version	A unique identifier of a version or release of the software.	2.3	_____
B4	D							Software Package Vendor	The name of the vendor that supplies or developed the software.	XYZ Corporation	_____
B5							M	Software Package upgrade	Is an upgrade required for Year 2000 problems? (yes/no)	no	_____
B6							M	Quantity to upgrade	If upgrade required for Year 2000, quantity required (or n/a)	n/a	_____
B7	D		C				M	Programming Language	The programming Language(s) used by the system.	Ada	_____
B8							M	Compiler Availability	Is the compiler/assembler available? (yes/no)	yes	_____
B9	*		C					Source Lines of Code	Source Lines of Code (SLOC) or Equivalent	600,000	_____
B10						P		Executable Lines of Code-Weapons Systems	Executable Lines of Code (source code minus overhead data, or use 80% of SLOC) that are part of an "Embedded Weapons System"	100,000	_____
B11						P		Executable Lines of Code-AIS	Executable Lines of Code (source code minus overhead data, or use 80% of SLOC) that are part of an "Automated Information System"	0	_____
B12							M	Total Executable Lines of Code	Total of above two numbers	100,000	_____
B13			C					Lines of Code to convert for Year 2000	Estimated Lines of Code that must be converted for Year 2000	2,000	_____
B14							M	Documentation	Is Requirements and Design Documentation available? (Yes/No)	Yes	_____
B15							M	Source Code Availability	Is source code available? (Yes/No)	Yes	_____
B16							M	Date Related Modules/files	Percent of software modules/files that is date related	25%	_____
B17							M	Date Related Code	Percent of Source code that is date related	10%	_____
B18							M	Date Formats	Consistency within the system of a standard date format (high, medium, low)	medium	_____
								Do the following Year 2000 Problems Exist:			

SPAWAR System Inventory Contents

Field Number	D = DIST Reqt.	O = OMB Reqt.	C = Congress(Horn)	N = NISMC Reqt.	S = SPAWAR Reqt	P = OSD/C3I Reqt	M = Model Calib.	FIELD IDENTIFIER	DEFINITION	EXAMPLE	YOUR SYSTEM
B19							M	Two-digit year	Yes/no	yes	_____
B20							M	Six-digit date (e.g., mm/dd/yy)	Yes/no	no	_____
B21							M	Leap year errors	Yes/no	no	_____
B22							M	Inaccurate date calculations	Computations, comparisons, assignments, other operations (yes/no)	yes	_____
B23							M	On-Line screen changes	Yes/no	no	_____
B24							M	Report form changes	Yes/no	no	_____
								Support Software Information			
B25	D							Operating System Name	The operating system used	SUN OS UNIX	_____
B26	D						M	Operating System Version	A unique identifier of a version or release of the operating system.	4.1.1	_____
	D							Operating System Vendor	The name of the vendor that supplies or developed the operating system.	Microsystems Inc.	_____
B27							M	Operating System Upgrade	Is an Operating System Upgrade required for Year 2000 problems? (yes/no)	no	_____
B28											
B29	D						M	Data Base Management System (DBMS) name (if used)	The DBMS used	ACCESS	_____
B30	D							DBMS Version	A unique identifier of a version or release of the DBMS.	6.0	_____
B31	D							DBMS Vendor	The name of the vendor that supplies or developed the DBMS.	Microsoft	_____
B32							M	DBMS Elements	Number of date-related data elements	45	_____
B33							M	DBMS Space	Amount of available storage space (memory) - in MegaBytes or "unlimited"	unlimited	_____
B34							M	DBMS Upgrade	Is a DBMS Upgrade required for Year 2000 problems? (yes/no)	no	_____
B35	D							Network software name (if used)	The Network software used	UCX	_____
B36	D							Network software Version	A unique identifier of a version or release of the Network software.	3.1	_____

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B37	D							Network software Vendor	The name of the vendor that supplies or developed the Network software.	DEC	_____
B38							M	Network Software Upgrade	Is a Network Software Upgrade required for Year 2000 problems? (yes/no)	no	_____
								Part C: Organization/Points of Contact (multiple entries possible)			
C1	D	O						Responsible Organization	The DoD organization responsible for this system (e.g., System Command)	SPAWAR	_____
C2	D							Resp. Organization's Role	Role of responsible organization with respect to the system (e.g., sponsor, Application Program Manager), select from "List B"	App Program Mgr	_____
C3				N				UIC	Responsible Organization's Unit Identification Code	N00039	_____
								Individual Point of Contact	Year 2000 Point of Contact for this system		
C4	D			N				POC Title	Title (e.g. Mr., CAPT, Dr.)	CDR	_____
C5	D			N				POC First Name	Year 2000 POC's First Name	John	_____
C6	D			N				POC Last Name	Year 2000 POC's Last Name	Doe	_____
C7				N				POC Office	Year 2000 POC's Office	PMW-199	_____
C8	*			N				POC e-Mail Address	Year 2000 POC's e-Mail Address	jdoe@spawar.mil	_____
C9	*			N				POC DSN	Year 2000 POC's DSN	555-5555	_____
C10	*			N				POC Commercial	Year 2000 POC's Commercial Number	618-555-5555	_____
C11	*			N				POC FAX	Year 2000 POC's Fax Number	618-555-5555	_____
								Technical Project Manager/POC			
C12	D			N				Maintaining (Field) Organization	Name of organization that maintains the system; the "Application Point of Contact"	NRaD	_____
C13	*							Maintaining Organization's UIC	Maintaining Organization's Unit Identification Code	N66001	_____
C14	*							Tech POC Title	Title (e.g. Mr., CAPT, Dr.)	Ms.	_____
C15	*							Tech POC First Name	Technical POC's First Name	Jane	_____
C16	*							Tech POC Last Name	Technical POC's Last Name	Doe	_____
C17								Tech POC Office/Code	Technical POC's Office Symbol (Full Organization)	NRaD Code D99	_____
C18	*							Tech POC e-Mail Address	Technical POC's e-Mail Address	doej@nosc.mil	_____

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C19	*							Tech POC DSN	Technical POC's DSN	555-5555	_____
C20	*							Tech POC Commercial	Technical POC's Commercial Number	618-555-5555	_____
C21	*							Tech POC FAX	Technical POC's Fax Number	618-555-5555	_____
								Part D: Hardware Information (multiple entries possible)			
D1	D						M	Hardware type	Specify: Processor (CPU), communications devices, or data storage devices	processor	_____
D2	D							Hardware Size	Specify: Mainframe, Micro, Mini, Supercomputer, Workstation, or unknown	Mainframe	_____
D3	D							Hardware Model	Model Number of the Hardware	2000	_____
D4	D							Hardware Series	Series Number(Generic Family of Equipment Items) of the Hardware	1	_____
D5	D							Hardware Manufacturer	Manufacturer of Hardware Platform(s)	UNISYS	_____
D6							M	Hardware upgrade	Is an upgrade required for Year 2000 problems? (Yes/no)	No	_____
D7							M	Upgrade quantity	If upgrade is required for Year 2000, quantity required (or n/a)	n/a	_____
D8							M	BIOS Compliance	Is the hardware Basic Input/Output System (BIOS) Year 2000 compliant? (yes/no)	yes	_____
								EC/EDI Interfaces			
D9	D							EC/EDI Interface	Logical field that indicates whether the system has an Electronic Commerce/Electronic Data Interchange (EC/EDI) interface. (yes/no)	No	_____
D10	D							EC/EDI Enhancement Plan	Logical field that indicates whether the system has plans to implement an EC/EDI interface. (yes/no)	Yes	_____
D11	D							EC/EDI Target Date	Target date for the system to implement an EC/EDI interface (mm/dd/yyyy)	1/30/1995	_____
								Interface Information (multiple entries possible)			
D12	D							Source System	System Acronym from which an interface is received	IMAPMIS	_____

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D13	D							Interface Security Classification	The security classification/sensitivity of the interface. Pick from "List C."	Unclas	_____
D14	D							Interface Transfer Media	The type of media with which the data is being transferred. Pick from "List D."	Communications Transfer-Electronic Data Interchange	_____
D15	D							Interface Status	The status of an interface: either "Planned for Implementation" or "Already in Existence."	Planned	_____
D16	D							Interface Transfer Frequency	The number of times over time that interface information is received. Pick from "List E."	Real Time	_____
D17							M	Input Bridge	Will bridges be required for Y2K compliance of data inputs? (yes/no)	no	_____
D18							M	Output Bridge	Will bridges be required for Y2K compliance of data outputs? (yes/no)	no	_____
								Part E: Year 2000 Compliance			
E1				N				Y2K Problem Status	A = Assessment complete; No known Problem with Year 2000 B = Known Problem; fix already in place C = Known Problem; fix in next release D = Known Problem; fix under development E = Known Problem; will fix before year 2000 F = Known Problem; fix dependent on tools (software engineering environment) G = Known Problem; fix dependent on COTS (hardware or software upgrade) H = Known Problem; will not fix I = System to be terminated before fiscal year 2000 J = Assessment not completed	E	_____
E2	*			N				System Termination Date	If Status above is J, date system will be terminated	5/31/1995	_____
E3				N				Assessment Completion Date	If Status above is I, date assessment will be completed	5/31/1992	_____

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Field Number	D = DIST Reqt.	O = OMB Reqt.	C = Congress(Horn)	N = NISMC Reqt.	S = SPAWAR Reqt	P = OSD/C3I Reqt	M = Model Calib.	FIELD IDENTIFIER	DEFINITION	EXAMPLE	YOUR SYSTEM
E4	D							Y2K Hardware Platform Compliance	Is the Hardware Y2K Compliant? (yes/no)	Yes	_____
E5	D							Y2K Operating System Compliance	Is the Operating System Year 2000 Compliant? (yes/no)	Yes	_____
E6	D							Y2K System Application(s) Compliance	Are the system applications Year 2000 Compliant? (yes/no)	No	_____
E7							M	Sort Routine Compliance	Are the sort routines Year 2000 Compliant? (yes/no)	yes	_____
E8							M	Backup Routine Compliance	Are the backup routines Year 2000 Compliant? (yes/no)	yes	_____
E9							M	Archival Routine Compliance	Are the archival routines Year 2000 Compliant? (yes/no)	yes	_____
								End of Survey for systems with no Previous/Current/Future Year 2000 problems (i.e., status A or I above)			
								Part F: Year 2000 Resolution Risks and Status			
F1	D							Date System Application(s) will be Y2K Compliant	The estimated date of systems application(s) Y2K compliance (mm/dd/yyyy)	12/30/1995	_____
F2				N				Unfixed Y2K Problems	If the system has a known problem that will not be fixed, please explain.	Graphic Interface subsystem with Y2K problems to be replaced 6/1/1999.	_____
								Year 2000 Strategy you will use:			
F3							M	Field Expansion	Yes/no	no	_____
F4							M	Procedural code	Yes/no	no	_____
F5							M	Sliding Window	Yes/no	yes	_____
F6							M	Other	Describe	n/a	_____
F7							M	Tools to Find	Will tools be used to fix Y2K Problems? (yes/no)	yes	_____
F8							M	Tools to Fix	Will tools be used to find Y2K Problems? (yes/no)	no	_____

SPAWAR System Inventory Contents

Field Number	D = DIST Reqt.	O = OMB Reqt.	C = Congress(Horn)	N = NISMC Reqt.	S = SPAWAR Reqt	P = OSD/C3I Reqt	M = Model Calib.	FIELD IDENTIFIER	DEFINITION	EXAMPLE	YOUR SYSTEM
F9							M	Tool Availability	Are Programmer/System software utilities and development tools available to support software changes (yes/no)	no	_____
F10							M	Application Expertise	RED: low programmer familiarity with application; YELLOW: medium familiarity; GREEN: high familiarity	YELLOW	_____
F11							M	Language Expertise	RED: low programmer familiarity with programming language; YELLOW: medium familiarity; GREEN: high familiarity	GREEN	_____
F12							M	Special Upgrade	Will Year 2000 fixes require a special upgrade or installation (as opposed to normal release cycle) (yes/no)	no	_____
F13					S			Mission Criticality/Risk	RED: System is critical to the mission; YELLOW: workarounds are possible for the short term; GREEN: workarounds can be used indefinitely	YELLOW	_____
F14					S			Technical Risk	RED: High number of interfaces, COTS, poor availability of code, etc.; YELLOW: moderate complexity; GREEN: low complexity	GREEN	_____
F15					S			Funding Resources Risk	RED: Poor/no availability to solve problem; YELLOW: moderate availability; GREEN: adequate availability	YELLOW	_____
F16					S			People Resources Risk	same as above	GREEN	_____
F17					S			Facilities Resources Risk	same as above	YELLOW	_____
F18					S			Contractor Support Risk	same as above	GREEN	_____
F19					S			Time/Schedule Risk	RED: Inadequate time left until target date; YELLOW: marginal time left; GREEN: adequate time left	GREEN	_____
								<u>Assessment Phase</u>			
F20					S			Planned Start	Planned Date for System to Enter Assessment Phase	9/30/1991	_____
F21					S			Actual Start	Actual Date System Entered Assessment Phase	10/31/1991	_____

SPAWAR System Inventory Contents

Field Number	D = DIST Reqt. O = OMB Reqt. C = Congress(Horn) N = NISMC Reqt. S = SPAWAR Reqt P = OSD/C3I Reqt M = Model Calib.	FIELD IDENTIFIER	DEFINITION	EXAMPLE	YOUR SYSTEM
F22	S	Status of Assessment Phase	RED: Action not begun or behind schedule; YELLOW: action recently begun; GREEN: Action underway, on schedule; BLUE: Action complete	BLUE	_____
		Renovation Phase			
F23	S	Planned Start	Planned Date For System To Enter Renovation Phase	5/31/1992	_____
F24	S	Actual Start	Actual Date System Entered Renovation Phase	6/23/1992	_____
F25	S	Status of Renovation Phase	RED: Action not begun or behind schedule; YELLOW: action recently begun; GREEN: Action underway, on schedule; BLUE: Action complete	BLUE	_____
		Validation Phase			
F26	S	Planned Start	Planned Date for System to Enter Validation Phase	12/31/1992	_____
F27	S	Actual Start	Actual Date System Entered Validation Phase	1/31/1993	_____
F28	S	Status of Validation Phase	RED: Action not begun or behind schedule; YELLOW: action recently begun; GREEN: Action underway, on schedule; BLUE: Action complete	YELLOW	_____
F29	M	Test Environment	Will you establish a special Y2K test environment? (yes/no)	no	_____
F30	M	Unit Test	Will you conduct Y2K Unit Testing? (yes/no)	yes	_____
F31	M	Integration Test	Will you conduct Y2K Integration Testing? (yes/no)	yes	_____
F32	M	System Test	Will you conduct Y2K System Testing? (yes/no)	no	_____
F33	M	Acceptance Test	Will you conduct Y2K Acceptance Testing? (yes/no)	no	_____
		Implementation Phase			

Field Number	D = DIST Reqt.	O = OMB Reqt.	C = Congress(Horn)	N = NISMC Reqt.	S = SPAWAR Reqt	P = OSD/C3I Reqt	M = Model Calib.	FIELD IDENTIFIER	DEFINITION	EXAMPLE	YOUR SYSTEM
F34					S			Planned Start	Planned Date for System to Enter Implementation Phase	2/28/1993	_____
F35					S			Actual Start	Actual Date System Entered Implementation Phase	6/30/1993	_____
F36					S			Status of Implementation Phase	RED: Action not begun or behind schedule; YELLOW: action recently begun; GREEN: Action underway, on schedule; BLUE: Action complete	RED	_____
F37							M	Site count	Number of sites requiring new installation for Y2K	3	_____
								Date System will be Certified as Y2K Compliant			
F38	D				S			Planned Compliance	Planned Date System Will Be Certified As Year 2000 Compliant	12/30/1994	_____
F39					S			Actual Compliance	Actual Date System Was Certified As Year 2000 Compliant	11/29/1994	_____
								Part G: Year 2000 Compliance Costs			
G1	D							HW and System Software Cost	Estimated Year 2000 Resolution Cost for Hardware (HW) and Operating Systems (OS) (in $thousands)	$250	_____
G2	D							HW and OS Budget Shortfall	Hardware and Operating System Software Year 2000 Compliance Budget Shortfall (in $thousands)	$105	_____
G3	D							App Software Y2K Compliance Cost	The cost to bring application software into Y2K compliance (in $thousands)	$100	_____
G4	D							Application Software Y2K Compliance Cost	The cost to bring application software into Y21K compliance (in $thousands)	$75	_____
G5			C					New Needs	Have you made or do you anticipate making any "new needs" requests for your Year 2000 project, as opposed to providing for it through budget reallocations? If yes, provide details of the request.	no	_____

SPAWAR System Inventory Contents

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G6			C					Level of effort	How many person-work years do you estimate will be devoted to your "Year 2000" project?	4.5	_____
G7			C					In-House Work	What proportion of the Year 2000 work will be done in-house? (percent)	25%	_____
G8			C					Outsourced work	What dollar value of Year 2000 work will be outsourced? ($thousands)	$250	_____
G9			C					Contract Value	What dollar value of existing or anticipated maintenance or support contracts involve a substantial component of Year 2000 work? ($thousands)	$300	_____
								Year 2000 Compliance Costs for Information Technology Systems only			
								(see OMB Circular A-11, section 43.1-43.2)			
								Report costs for FY1996 through FY2000 for the following categories ($millions):			
								1. EQUIPMENT	($ millions) (includes micros, minis, supercomputers, PBXs, peripherals, disk/tape drives, optical storage, digital comm/networks, multiplexers, concentrators, telephones, digital imaging)		
G10		O						A. Capital Purchases	(unit/system cost > $100 thousand)	$20	_____
G11		O						B. Small Purchases/Leases	(unit/system cost <= $100 thousand; includes hardware lease costs)	$30	_____
								2. SOFTWARE	($ millions) (includes firmware, systems programs, COTS applications)		
G12		O						A. Capital Purchases	(unit/system cost > $100 thousand)	$10	_____
G13		O						B. Small Purchases/Leases	(unit/system cost <= $100 thousand; includes software lease costs)	$5	_____

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		3. SERVICES	($ millions) (includes any service performed or furnished by using IT hardware/software, e.g., teleprocessing, email, voice mail, centrex, cellular telephone, facsimile, packet switching)		
G14	O	A. Communications(Voice/Data)	($ millions)	$25	_____
G15	O	B. Processing	($ millions)	$35	_____
G16	O	C. Other	(I.e., purchases of communications and processing services where costs are not separable)	$5	_____
		4. SUPPORT SERVICES	($ millions) (includes labor-intensive contractual services, e.g., custom software development, software conversion, modification, and maintenance; equipment maintenance)		
G17	O	A. Software	($ millions)	$6	_____
G18	O	B. Equipment Maintenance	($ millions)	$3	_____
G19	O	C. Other	(e.g., studies, analyses, site prep, network design and mgmt, equip operation, fac mgmt, training)	$2	_____
G20	O	5. SUPPLIES	($ millions) (consumables designed for use w/ IT hardware, software, services, support services)	$12	_____
		6. PERSONNEL (COMPENSATION/BENEFITS)	($ millions) (pay/benefits of military/civilian personnel who spend >= 51% of time performing IT functions)		
G21	O	A. Software	($ millions)	$2	_____
G22	O	B. Equipment Maintenance	($ millions)	$4	_____
G23	O	C. Processing	($ millions)	$6	_____
G24	O	D. Communications	($ millions)	$8	_____
G25	O	E. Other	($ millions)	$2	_____
G26	O	7.OTHER IN-HOUSE FIP RESOURCES ($ millions)	(includes in-house support not defined elsewhere, e.g., cost of IT-related space, travel of IT personnel, and IT-related printing)	$12	_____

SPAWAR System Inventory Contents

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G27	O	8. INTRA-GOVERNMENTAL PAYMENTS	Paying (i.e., customer) activities should report payment costs in categories #1 through #7 above.	$25	_____
G28	O	9. INTRA-GOVERNMENTAL COLLECTIONS	Collecting (i.e., provider) activities should not report any costs.	$5	_____
G29	O	10. Total Obligations (Funded)	($ millions)	$227	_____
G30	O	11. Total Estimated/Required	($ millions)	$0	_____

End of Requirements

APPENDIX C

YEAR 2000 ASSESSMENT CHECKLIST

ASN(RD&A) defines "Year 2000 Compliance" as fault-free performance in the processing of data and date-related data (including but not limited to calculating, comparing, and sequencing) by all hardware and software products, individually and in combination. Fault-free performance must include the manipulation of data when dates are in the 20th or 21st century and must be transparent to the user. Each system must be examined individually for its processing of dates. The following is a brief checklist of issues, problems already encountered, and reminders to assist system development and maintenance personnel in the assessment of Y2K compliance. This list is not all-inclusive, it is intended as a "thought provoker." YES answers are potential problems requiring further investigation on your part.

YES	NO	Does this apply to your system?
___	____	1. Use of 2-digit years vice 4-digit years for inputs, messages, internal processing, data storage, and /or outputs. (Consider date manipulation during comparisons, calculations, sorting, and use of file system/tape system tags)
____	___	2. Input of 2-digit date fields in user/operator entries, scripts, schedules of events, or startup dates, and performance of date validation checks
____	___	3. Rejection of inputs with dates of '00 (meteorological systems had this problem)
____	___	4. Date comparisons made without date validation checks, e. g., If current time is less than previous time, is the data ignored?
____	___	5. Processing of time periods greater that 100 years, or across year 2000 boundary. (Airline and telephone systems have this problem)
____	___	6. Checks for valid date ranges, including restrictions due to overflows
____	___	7. Sorting of messages or files so that year '00, '01, etc. incorrectly sort BEFORE '99 (Could affect budgets, schedules, and projections beyond 2000)

____ ___ 8. Retrieval or deletion messages with dates beyond 1999, or with dates before 2000 after 01/01/2000. (Air Force systems had this problem)

____ ___ 9. Records such as clearances, visit requests, and licenses with expiration dates beyond 2000 improperly processed or rejected as "expired." (Mastercard and security systems have this problem)

____ ___ 10. Use of special values (magic numbers) in date fields, such as "00", "0/00/00", "1/11/11", "99", "98", or "9/9/99." (Could represent end-of-file, no data, or other special flags unrelated to the system's mission)

____ ___ 11. Use of hard coded "19", "98", "99", "00" in the formulas for dates

____ __ 12. Use of 12/31/99 expiration date as "save to infinity" - causing records to be erased in 2000

____ ___ 13. Interpretation of new inventory records with expiration dates in '00 as "too old," resulting in inventories being discarded or rejected. (Blood banks and inventory systems have this problem)

___ ____ 14. Incorrect calculation of time duration across 01/01/2000, affecting tracking programs, time elapsed calculations, and aging calculations

___ ____ 15. Date formats stored internally using an unconventional base date with an offset of the number of seconds/minutes/ hours/days/weeks since that base date. (GPS has this problem)

____ ___ 16. Register overflow during date calculations of base dates plus offsets. (Consider the size of the data type that is used to store the offset: 8-bit, 16-bit, 32-bit, 64-bit, other)

YES	NO	Does this apply to your system?
____	___	17. Failure to calculate for Leap Years using all three required rules: • If the year is divisible by 4, it is a leap year, UNLESS • The year is also divisible by 100, then it's not a leap year, UNLESS • The year is also divisible by 400, then it is a leap year (So 2000 is a leap year, 1900 and 2100 are not. JTIDS and USAF Airborne C&C systems calculate this incorrectly)
___	____	18. Importing date data from, or exporting to, other applications and/or systems using Leap year, 2 digit dates, and dates after 2000
____	___	19. Use of COTS products that rely on the date for licensing, that could prematurely "expire" on 01/01/2000
____	___	20. Use of older versions of ORACLE and ORACLE-DBMS that do not have newer roll-over "rr-data" type
		21. Use of these date milestones in your system:
____	___	1995-10-01 Plans for 5 Fiscal Years or more extend to FY2000
____	___	1996-01-01 overflows Unisys mainframe
____	___	1996-01-01 Four-year plans (budgets, op plans, strategies) end in 2000
____	___	1996-Autumn "Class of 2000" enters academies and colleges
____	___	1996-10-01 Plans for 4 Fiscal Years or more extend to FY2000
____	___	1997-01-01 Three-year plans extend to 2000
____	___	1998-01-01 Two-year plans extend to 2000
___	____	1999-08-22 GPS rolls back to 1980-01-06 (uses 1024-week cycle)
____	___	1999-09-09 9/9/99 flag for record deletion
____	___	1999-10-01 Government's FY2000 begins
____	___	2000-01-01 overflows 2-digit years
____	___	2000-01-10 first 9-character date

____	___	2000-10-10	first 10-character date
____	___	2000-02-29	Leap Year(1900 was not) (JTIDS tables are incorrect)
____	___	2001-01-01	Twenty First Century (not 2000)
____	___	2001-10-03	overflows Tandem systems
____	___	2019-12-31	yy-date limit of Microsoft Excel 95
____	___	2029-12-31	yy-date limit of Microsoft Excel (next major version)
____	___	2034-01-01	Share/43 rolls back to 1970
____	___	2036-12-31	date limit of Visual C++ (4.x) runtime library
____	___	2049-12-31	date limit of Microsoft Project 95 and previous versions

___ ____ 22. Failure of the "Rollover Test," where the system's date is set to 12/31/1999, the system turned off to allow roll over of century, then turned back on to check dates (See sample instructions for PCs and Macintoshes on Internet at http://infosphere.safb.af.mil/~jwid/fadl/valida.htm Other tests can be tailored.)

____ ___ 23. Use of proportional-character printer forms or terminal screens which may overflow or line-wrap with a 20xx year instead of a 19xx year

___ ____ 24. Interface with the Global Positioning System (GPS), whose 1024-week calendar rolls back to 1980 on August 22, 1999

___ ____ 25. Dates are stored using unconventional data names, or names "overlaid" or "equated" to your data names of year, yr, date, century, time, mmddyy, mmddyyyy, ddmmyy, ddmmyyyy, yyddd, yyyydd, clock, time_in, time_out, sent, received, age, purge, expire, nineteen, twenty, elapsed; or combinations of these and other terms such as xxx_year, year_xxx, etc.

APPENDIX D. SPAWAR STATUS REPORTS

A summary of the SPAWAR Y2K status as of Friday, 25 July:

1. Numerous changes were made this period. Two systems have been deleted (two CUDIXS entries were merged; IPGPS/EPLGR is assigned to JPO). Two checklists, seven inventory forms, and several updates were received. Of the 160 systems, 158 are now in DIST with at least basic information. Of the two remaining, we don't have enough info to enter GVRC, and ECIM is being terminated.

2. We are tracking 160 SPAWAR systems. We are also negotiating about several other possible systems with NAVMASSO and SPAWAR 07.

- Inventory forms have been received for 144.
- Signed checklists have been received for 127.
- DIST entries have been made for 158.

3. 18 systems still have "J" status - internal assessment not complete. The target completion date for the Assessment Phase was 30 June. These unassessed systems are:

NRaD: FVLF SSPA, SST

PMW176: JMINI DAMA SAC, SSIXS-SMART, PORTABLES, SRC-54 SINCGARS, HAFB,ARQ-53 SINCGARS, MCIXS

PMW181: ZEUS

PMW185: GFO

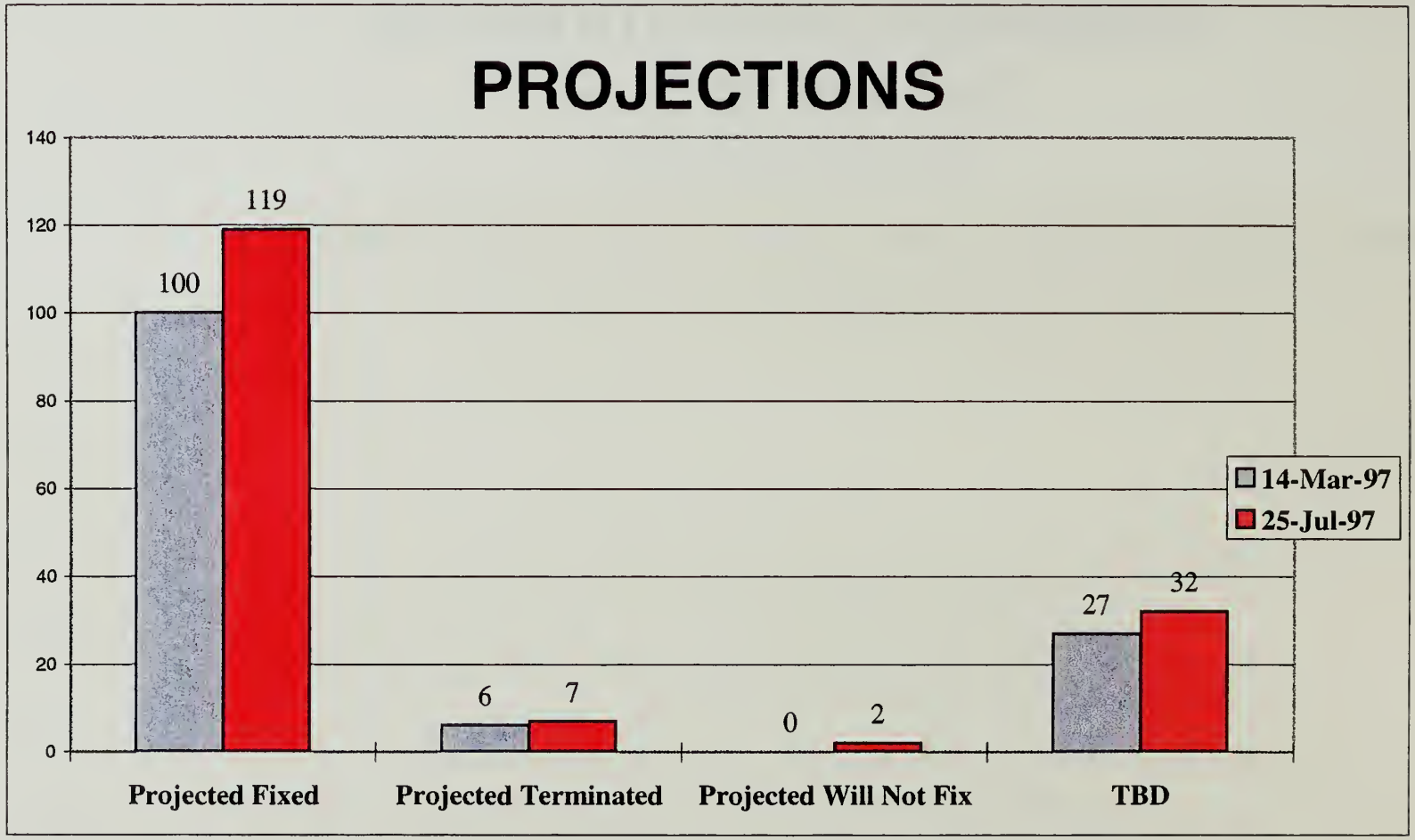
PMW187: GVRC, 6 parts of NAVSSI

4. By the way, on the SPAWAR webpage at http://www.nosc.mil/spawar/programs/ there are 162 "Programs, Products, and Services" listed by PMW. Only 42 of these are in our systems inventory -

others include hardware, studies, etc. But many sound like software systems to me: Automated Surface Observing System, Defense Message System, MATCALS, NSIPS, SMOOS, WWMCCS/GCCS - are all these systems or their replacements/components covered in our Y2K inventory? One of our major tracking problems is defining system names and system boundaries.

5. Pilot system assessments are being conducted by MITRE on NAVMACS II and NAVSSI. 4 to 8 weeks effort remain.

	Total Systems	Assess -ment Needed	Signed Chlists Needed	Inventory Forms Needed	POC
NRaD	2	2	2	2	Singer
PD13	3	0	0	0	Colket (Complete!)
PMW-151	27	0	6	1	Howard, Rieken
PMW-152	9	0	0	0	DeGraff,Rieken (Complete!)
PMW-161	2	0	0	0	Grant (Complete!)
PMW-162	2	0	0	0	Grant (Complete!)
PMW-163	11	0	0	0	Grant (Complete!)
PMW-171	5	0	0	0	Magno, Jih (Complete!)
PMW-173	15	0	0	0	Jensen, Jih (Complete!)
PMW-176	49	7	20	6	Jih
PMW-181	3	1	1	1	Cockerill
PMW-182	2	0	0	0	Cockerill (Complete!)
PMW-183	1	0	0	0	Cockerill (Complete!)
PMW-185	3	1	0	1	Cockerill
PMW-187	16	7	2	2	Cockerill
PEO-SCS	8	0	0	1	Pollack
SPAWAR 05/07	3	0	2	2	Anderson/Hamaguchi
Totals	160	18	33	16	


PROJECTIONS
140
120
100
80
60
40
20
0
100
119
6
7
0
2
27
32
14-Mar-97
25-Jul-97
Projected Fixed
Projected Terminated
Projected Will Not Fix
TBD

ACTION STATUS (by organization)
As of 25 July 1997
(In Number of Systems)

	NRaD	PD13	PD15	PD16	PD17	PD18	PEO-SCS	SPAWAR	Total
Awareness	0	0	0	0	0	0	0	0	0
Assessment	2	0	0	0	7	9	0	0	18
Renovation	0	2	27	11	33	6	1	1	81
Validation	0	0	0	0	0	0	0	0	0
Implementation	0	1	9	4	28	10	7	2	61
Total	2	3	36	15	68	25	8	3	160

APPENDIX E. SPAWAR SYSTEM INVENTORY RESULTS

SPAWAR SYSTEM INVENTORY

AS OF JULY 25, 1997

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
131	NRaD 88	FVLF SSPA	FIXED VLF SOLID STATE POWER AMPLIFIER		J	NO			As	99007699							Search continues: 4/23: Rudy Savarese PMW-173 refers us to Paul Singer, NRaD D8505. 4/24: Forms sent to Singer. 5/13: Singer working on it. 7/7: Email reminder to Singer. 7/23: Voicemail- Singer will contact NISE EAST again.	Not received.
133	NRaD 89	SST	SOLID STATE TRANSMITTER		J	NO			As	99007700							Search continues: 4/23: Rudy Savarese PMW-173 refers us to Paul Singer, NRaD D8505. 4/24: Forms sent to Singer. 5/13: Singer working on it. 7/7: Email reminder to Singer. 7/23: Voicemail- Singer will contact NISE EAST again.	Not received.
44	PD13-PMW-131	ENWGS	ENHANCED NAVAL WAR GAMING SYSTEM	-	G	Partial	S	E	Ren	31001675		$0	$0	1,600,000	0	4/97	I status on Inventory changed to G per C.Colket email 6/11.	OK
45	PD13-PMW-131	NSS	NAVY SIMULATION SYSTEM		E	YES	S	E	Ren	99006737		$0	$0	0	160,000	4/97	Restored 5/14/97. Was NSS/TMS.	OK
46	PD13-PMW-133	SHPL/ APPEX	SCALABLE HIGH PERFORMANCE LAN/ADVANCED POWER PROJECTION PLANNING AND EXECUTION	JPP/RTS	A	NO	S	E	Imp	99006232		$0	$0	"n/a"	"n/a"			No ELOC in B10, B11
155	PD15-PMW-151	SNAP I LEGACY	LEGACY SNAP I SHIPBOARD NON-TACTICAL ADP PROGRAM	NTCSS	I	YES		E	Imp	99006662		$0	$0	0	3,606,932	4/97	(All PMW-151 systems part of NTCSS, DIST 99001418).Status J to I; will terminate by 6/99 per LCDR Howard, 6/23	Needs dates in Part F, costs in Part G. I status changed to J.
156	PD15-PMW-151	SNAP II LEGACY	LEGACY SNAP II SHIPBOARD NON-TACTICAL ADP PROGRAM	NTCSS	I	YES		E	Imp	99006663		$0	$0	0	1,168,180	4/97		OK
157	PD15-PMW-151	SNAP I (UNIX PORT)	PORTED SNAP I SHIPBOARD NON-TACTICAL ADP PROGRAM	NTCSS	D	YES		E	Ren	99006664		$777	$777	0	3,606,932	4/97		OK
158	PD15-PMW-151	SNAP II (UNIX PORT)	PORTED SNAP II SHIPBOARD NON-TACTICAL ADP PROGRAM	NTCSS	E	YES	S	E	Ren	99005694		$591	$591	0	1,168,180	4/97	DIST had 2 entries: 99005694 for Maint. Data Subsystem (kept) and 99005696 for SNAP Fin. Mgt. Subsystem (archived)	OK
160	PD15-PMW-151	NALCOMIS IMA	NALCOMIS IMA	NTCSS	E	YES	S	E	Ren	99003764		$85700	$85700	0	2,800,000	4/97	$84M bogey added to costs	No dates in Part F, no costs in Part G.
161	PD15-PMW-151	NALCOMIS OMA	NALCOMIS OMA	NTCSS	A	YES	S	E	Imp	31002418		$0	$0	0	568,000	4/97		OK
162	PD15-PMW-151	MRMS	MAINTENANCE RESOURCE MANAGEMENT SYSTEM	NTCSS	E	YES			Ren	99001424		$200	$200					Not received.
164	PD15-PMW-151	FSM	FOOD SERVICE MANAGEMENT SYSTEM	(stand alone)	D	YES	S	E	Ren	99005695		$447	$447	0	466,052	4/97		Need dates in Part F.
165	PD15-PMW-151	ATOS PLUS	AUTOMATED TRAVEL ORDER SYSTEM	NTCSS	C	YES	S	E	Ren	99005704		$127	$127	0	115,149	4/97		OK

* Checklists: S = Signed, U = Unsigned. **Sys Inv: E = Electronic, H = Hardcopy

SPAWAR SYSTEM INVENTORY

AS OF JULY 25, 1997

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
167	PD15-PMW-151	MRMS/ IPEMM	MRMS/IPEMM INDUSTRIAL PLANT EQUIPMENT MANAGEMENT	NTCSS	C	YES	S	E	Ren	99006666		$123	$123	0	111,876	4/97		Need dates in Part F.
171	PD15-PMW-151	ATIS	AUTOMATED TECHNICAL INFORMATION SYSTEM	NTCSS	C	YES	S	E	Ren	99006742		?	?	0	211,040	4/97	Status B per LCDR Howard 6/23, status C per Inventory 7/21	No costs in Part G
172	PD15-PMW-151	MRMS/ MPMR	MRMS/MPMR MICRO PERIODIC MAINTENANCE REQUIREMENTS	NTCSS	D	YES	S	E	Ren	99005702		$0	$0	0	48,868	4/97	Status B to D per Checklist	OK
173	PD15-PMW-151	PADPS	PURCHASE AUTOMATED DATA PROCESSING SYSTEM	NTCSS	C	YES	S	E	Ren	99005697		$169	$169	0	153,570	4/97		OK
174	PD15-PMW-151	AV3M	AVIATION MAINTENANCE MATERIAL MANAGEMENT	NTCSS	A	YES		E	Imp	99006665		$0	$0	see notes	see notes		No ELOC - *under development, with Y2K compliancy*	No ELOC in B10, B11
175	PD15-PMW-151	SNAP-SAMS	SNAP AUTOMATED MEDICAL SYSTEM	NTCSS	C	YES	S	E	Ren	31002892		$143	$143	0	129,882	4/97	DIST ID 99003020 deleted.	OK
176	PD15-PMW-151	DENMIS	DENTAL MANAGEMENT INFORMATION SYSTEM	NTCSS	D	YES	S	E	Ren	99005705		$62	$62	0	56,070		Status B to D per Checklist	OK
177	PD15-PMW-151	MRMS/ TLMS	MRMS/TLMS TECHNICAL LIBRARY MANAGEMENT SYSTEM	NTCSS	C	YES	S	E	Ren	99005698		$124	$124	0	112,599	4/97		OK
207	PD15-PMW-151	MSFM	MICRO SUPPLY & FINANCIAL MANAGEMENT SYSTEM	Micro SNAP	C	YES	S	E	Ren	99005701		$299	$299	0	208,585	4/97		OK
208	PD15-PMW-151	MSMS	MICRO SYSTEM MANAGEMENT SYSTEM	Micro SNAP	E	YES	S	E	Ren	99005700		$59	$59	0	60,000	4/97		OK
209	PD15-PMW-151	MOMMS	MICRO ORGANIZATIONAL MAINTENANCE MANAGEMENT SYSTEM	Micro SNAP	B	YES		E	Imp	99006573		$0	$0	-	-			No ELOC in B10, B11
210	PD15-PMW-151	FCP	FLEET COMMUNICATIONS PACKAGE	NTCSS	D	YES	S	E	Ren	99005703		"N/A"	-	0	30,000	4/97	$40K to fix in Program Review	Costs to fix = "N/A"
211	PD15-PMW-151	NALCOMIS IMA OPTIMIZED	NAVAL AVIATION LOGISTICS COMMAND MANAGEMENT INFORMATION SYSTEM, INTERMEDIATE MAINTENANCE ACTIVITIES, OPTIMIZED	NTCSS	K	YES	S	E	Ren	99004645		$0	$0	see notes	see notes		Status A to K per Checklist. No ELOC - *under development, with Y2K compliancy*	No ELOC in B10, B11
212	PD15-PMW-151	NALCOMIS OMA/AME	NALCOMIS OMA/AME ORGANIZATIONAL-LEVEL MAINTENANCE ACTIVITY / AUTOMATED MAINTENANCE ENVIRONMENT	NTCSS	K	YES	S	E	Ren	99004649		$0	$0	see notes	see notes		Status A to K per Checklist. No ELOC - *under development, with Y2K compliancy*	No ELOC in B10, B11
213	PD15-PMW-151	NTCSS-DANA	NTCSS-DANA DESK TOP ENVIRONMENT	NTCSS	K	YES	S	E	Ren	99006666		$0	$0	see notes	see notes		Status A to K per Checklist. No ELOC - *under development, with Y2K compliancy*	No ELOC in B10, B11
214	PD15-PMW-151	OMMS-NG	ORGANIZATIONAL MAINTENANCE MANAGEMENT SYSTEM - NEXT GENERATION	NTCSS	K	YES	S	E	Ren	99004647		$0	$0	see notes	see notes		Status A to K per Checklist. No ELOC - *under development, with Y2K compliancy*	No ELOC in B10, B11

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SPAWAR SYSTEM INVENTORY

AS OF JULY 25, 1997

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
215	PD15-PMW-151	RADM	RELATIONAL ADMINISTRATION MANAGEMENT	NTCSS	A	YES	S	E	Imp	99004648		$0	$0	0	30,597	4/97	Formerly SNAP III Optimized.	OK
216	PD15-PMW-151	RSUPPLY	RELATIONAL SUPPLY MANAGEMENT	NTCSS	K	YES	S	E	Ren	99004646		$0	$0	see notes	see notes		Formerly SNAP III Optimized.Status A to K per Checklist. No ELOC - "under development, with Y2K compliancy"	No ELOC in B10, B11
144	PD15-PMW-152	GATEGUARD	GATEGUARD	-	C	YES	see email	H	Ren	99006316	x	$4603	$4603	0	240,000	4/97		OK
145	PD15-PMW-152	PCMT	PERSONAL COMPUTER MESSAGE TERMINAL MARCEMP	-	C	YES	S	H	Ren	99006315	x	$7	$7	0	248,000	4/97		OK
146	PD15-PMW-152	MMS	MULTILEVEL MAIL SERVER	-	C	YES	S	H	Ren	99006317	x	$10	$10	30,000	0	4/97		OK
149	PD15-PMW-152	NOVA	NOVA	-	A	YES	S	H	Imp	99006314	x	$0	$0	0	148,000	4/97		OK
150	PD15-PMW-152	NCP II	NAVCOMPARS II NAVAL COMMUNICATIONS PROCESSING AND ROUTING	-	G	YES	S	H	Ren	99006318	x	$0	$0	0	2,400,000	4/97	Status H to G per Joelle Griffith, 6/26. NACOMPARS has DIST ID 31002429. (NCP II cancelled by CNO6/27. NAVCOMPARS is NCTC system)	OK
151	PD15-PMW-152	DUSC	DIRECTORY UPDATE AND SERVICE CENTER	-	G	YES	S	E	Ren	99006233	x	$0	$0	0	2,320,000	4/97	Status H to G per Joelle Griffith, 6/26.	OK
152	PD15-PMW-152	NAVMACS	NAVAL AUTOMATED MODULAR COMMUNICATIONS SYSTEM AN/SYQ-7(V) V2/V3/V5/V5A	-	A	YES	S	H	Imp	31002431	x	$0	$0	450,000	0	4/97	Merged former 152 (NAVMACS V5/V5A) with old 217 (NAVMACS V2) and 218 NAVMACS V3). Had 3 signed checklists and 3 inventory forms. All Status "A." One DIST entry.	OK
154	PD15-PMW-152	NAVMACS II	NAVAL AUTOMATED MODULAR COMMUNICATIONS SYSTEM AFLOAT COMPONENT AN/SYQ-7A(V) AN/SYQ-7B(V)	-	E	YES	S	H	Ren	99006319	x	$50	$10	0	350,000	4/97	PD-15 Pilot for Mitre	OK
178	PD15-PMW-152	CUDIXS	CUDIXS - COMMON USER DIGITAL INFORMATION EXCHANGE SYSTEM	-	A	YES	S	H	Imp	31001470	x	$0	$0	0	70,000	4/97	Originally reported from - PMW 176. Incorporates hardware portion of CUDIXS (formerly #153)	No System Function in A6
30	PD16-PMW-161	EKMS	ELECTRONIC KEY MANAGEMENT SYSTEM/TIER 1	EKMS	K	Partial	S	E	Ren	99006110		$0	$0	0	112,000	4/97		OK
116	PD16-PMW-161 (NRaD 87)	NKDS	NAVY KEY DISTRIBUTION SYSTEM	-	E	Partial	S	E	Ren	31002476		$510	$510	0	276,800	4/97	Was NKMS. NKDS has 5 parts: NKDS Processing, NKDS UI, CARS/FEP, WETS, and ANCRS.	OK
74	PD16-PMW-162	TDOA	TIME DIFFERENCE OF ARRIVAL	-	G	NO	S	H	Ren	99006332		-	-					No System Function and Activity in A6, A7; no ELOC in B10, B11; no dates in Part F; no costs in Part G

* Checklists: S = Signed, U = Unsigned. **Sys Inv: E = Electronic, H = Hardcopy

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
75	PD16-PMW-162	RFMP	RADIO FREQUENCY MAP PROGRAM	-	A	NO	S	H	Imp	99006276		$0	$0	108,000	0	4/97		OK
58	PD16-PMW-163	CHBDL-ST	COMMON HIGHBAND DATA LINK -Surface Terminal (BGPHES)	-	E	Partial	S	H	Ren	99000649		$315	$0	110,000	0	4/97		OK
138	PD16-PMW-163	CUB 2.2.3	CRYPTOLOGIC UNIFIED BUILD 2.2.3	NECSS	G	Partial	S	H	Ren	99006227		"n/a"	"n/a"	0	942,000	4/97	There is a leap year problem (Y2K) associated with the SI correlator software. The cost to fix this is $50K and is being implemented in the Dec 1996 build. See also #244, CUB 3.x	OK
244	PD16-PMW-163	CUB 3.x	CRYPTOLOGIC UNIFIED BUILD 3.X	NECSS	A	Partial	S	H	Imp	99006231		$0	$0	0	176,000	4/97	See also #138, CUB 2.2.3	OK
29	PD16-PMW-163 (NISE EAST)	ACCES	ADVANCED CRYPTOLOGIC CARRY-ON EXPLOITATION SYSTEM	Cryptologi c Carry On	K	Partial	S	H	Ren	99006252		$0	$0	0	240,000	4/97		OK
23	PD16-PMW-163 (NRaD D77)	BGPHES	BATTLE GROUP PASSIVE HORIZON EXTENTION SYSTEM - Surface Terminal	-	E	Partial	S	H	Ren	31001245		$545	$545	1,059,000	0	4/97		OK
24	PD16-PMW-163 (NRaD D77)	CDF AN/SRS-1	COMBAT DIRECTION FINDING AN/SRS-1	-	H	Partial	S	H	Imp	99006226		$0	$0	188,000	0	4/97	Status H: time window only a few minutes, problem will not be fixed. See Also #242 AN/SRS-1A	OK
25	PD16-PMW-163 (NRaD D77)	COBLU PHASE 0	COOPERATIVE OUTBOARD BASE LINE UPDATE PHASE 0	JMCIS	G	Partial	S	H	Ren	99006228		$100	$100	160,000	0	4/97	See also #243 - PHASE 1	OK
26	PD16-PMW-163 (NRaD D77)	SSEE	SHIPS SIGNAL EXPLOITATION EQUIPMENT (TACTICAL CRYPTOLOGIC SYSTEM)	-	K	Partial	S	H	Ren	99000687		$0	$0	0	240,000	4/97		No dates in F1, F20, F23, F26, F28, F34, F38; no cost info in G1,G2,G3
140	PD16-PMW-163 (NRaD D77)	OUTBOARD	OUTBOARD AN/SSQ-108(V) 3-6	NECSS	G	Partial	S	H	Ren	99006237		$70	$70	96,000	0	4/97		OK
242	PD16-PMW-163 (NRaD D77)	CDF AN/SRS-1A	COMBAT DIRECTION FINDING AN/SRS-1A	-	H	Partial	S	H	Imp	99006229		$0	$0	212,000	0	4/97	Status H: time window only a few minutes, problem will not be fixed. See also #24 AN/SRS 1	OK
243	PD16-PMW-163 (NRaD D77)	COBLU PHASE 1	COOPERATIVE OUTBOARD BASE LINE UPDATE PHASE 1	JMCIS	K	Partial	S	H	Ren	99006240		$0	$0	250,000	0	4/97	See also #25 - Phase 0	No Resolution/dates in Part F, no costs in Part G
35	PD17-PMW-171	JMCIS AFLOAT (NTCS-A)	JMCIS-AFLOAT (NTCS-A) NAVAL TAC CMD SYSTEM-AFLOAT	JMCIS	E	Partial	S	E171	Ren	31002527		$50	$50	0	5,654,160	4/97	1. JMCIS programs made up of a large number of segments(applications).	OK
38	PD17-PMW-171	JMCIS ASHORE	JOINT MARITIME COMMAND INFORMATION SYSTEM - Ashore Component	JMCIS	E	YES	S	E171	Ren	31002572		$120	$120	0	1,500,000	4/97		OK
37	PD17-PMW-171	JMCIS TSC/TM	JMCIS-TACTICAL MOBILE (TSC) TACTICAL SUPPORT CENTER	JMCIS	C	Partial	S	E	Ren	31003219		$210	$210	0	1,032,000	4/97		OK

* Checklists: S = Signed, U = Unsigned. **Sys Inv: E = Electronic, H = Hardcopy

SPAWAR SYSTEM INVENTORY

AS OF JULY 25, 1997

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
38	PD17-PMW-171	OBU/OED	OSIS BASELINE UPGRADE/OSIS EVOLUTIONARY DEVELOPMENT	JMCIS	E	YES	S	E-10	Ren	31002548		$550	$550	0	1,600,000	4/97		OK
223	PD17-PMW-171	Naval COE/JMCIS	Naval COE/JMCIS NAVAL COMMON OPERATING ENVIRONMENT	DII COE	C	YES	S	E171	Ren	99006221		$10	$10	0	1,280,000	4/97		OK
205	PD17-PMW-173	SCAT	SUBMARINE COMMUNICATIONS ASSESSMENT TOOL	-	D	YES	S	H	Ren	99006238	x	$0	$0					No System Function in A6, no system Activity in A7; ELOC = "none" in B10, B11 but SLOC = 5000
206	PD17-PMW-173	IVTT	INTEGRATED VERDIN TRANSMIT TERMINAL	ISABPS	A	YES	S	H	Imp	99006239	x	$0	$0	24,800	0	4/97	Previously included with #92	OK
86	PD17-PMW-173 (NRaD 83)	BBS-INM	BASEBAND SWITCH Integrated Network Manager	BBS	E	YES	S	H	Ren	99006230	x	$100	$0	0	46,000	4/97		OK
87	PD17-PMW-173 (NRaD 83)	CMF-ASHORE	CMF-ASHORE CIRCUIT MAYFLOWER	SPECOM M	G	YES	S	H	Ren	31002225	x	$45	$0	19,100	0	4/97		No dates in F20, F23, F26, F28, F34, F38
88	PD17-PMW-173 (NRaD 83)	DLCS LINK 11	Data Link Communication System - Submarine AN/USQ-76(V)3 Link 11 Data Terminal Set	SSN DLCS	A	YES	S	H	Imp	99006241	x	$0	$0	120,000	0	1/97		No ELOC in B10, B11
89	PD17-PMW-173 (NRaD 83)	EVS	ENHANCED VERDIN SYSTEM	-	A	YES	S	H	Imp	31001707	x	$0	$0	2,000	0	4/97		OK
91	PD17-PMW-173 (NRaD 83)	TRIDENT IRR	TRIDENT INTEGRATED RADIO ROOM (CM11)	TRIDENT ECS	C	YES	S	H	Ren	99006242	x	$40	$40	0	380,000	4/97		No cost information in G1,G2, G3
92	PD17-PMW-173 (NRaD 83)	ISABPS	INTEGRATED SUBMARINE AUTOMATED BROADCAST PROCESSING SYSTEM - Ashore	ISABPS	G	YES	S	H	Ren	99006243	x	$267	$267	37,000	0	4/97		OK
94	PD17-PMW-173 (NRaD 83)	MEECN/HIDAR	MINIMUM ESSENTIAL EMERGENCY COMMUNICATIONS NETWORK / HIGH DATA RATE	-	A	YES	S	H	Imp	99006244	x	$0	$0	11,000	0	1/97		NO ELOC in B10, B11
95	PD17-PMW-173 (NRaD 83)	MLTS	MULTI LINK TRANSMIT SIMULATOR	TRIDENT IRR	A	YES	S	H	Imp	99006248		$0	$0	0	38,250	4/97		OK
98	PD17-PMW-173 (NRaD 83)	SLVR	SUBMARINE LF/VLF VME BUS RECEIVER	-	A	YES	S	H	Imp	99006249	x	$0	$0	61,000	0	4/97		No POC information in C4-C21
99	PD17-PMW-173 (NRaD 83)	SMB	SUBMARINE MESSAGE BUFFER	-	E	YES	S	H	Ren	99006242	x	$220	$0	0	52,800	4/97		OK
100	PD17-PMW-173 (NRaD 83)	TFDS	TIME AND FREQUENCY DISTRIBUTION SYSTEM	-	K	YES	S	H	Ren	31003148		$0	$0	"Proc Sensitive"	"Proc Sensitive"			NO ELOC in B10, B11
102	PD17-PMW-173 (NRaD 83)	VERDIN	VERDIN	-	A	YES	S	H	Imp	99006248	x	$0	$0	70,000	0	4/97		OK
136	PD17-PMW-173 (NRAD 83)	NISBS	NATO INTEROPERABLE SUBMARINE BROADCAST SYSTEM	FSBS	G	YES	S	H	Ren	99006249	x	$75	$75	12,134	12,134	4/97	NRaD Code D83 reports for PMW-173	No dates in F23,F26,F34,F38
8	PD17-PMW-176-1	SACCS	SHIP AUTOMATED COMMUNICATION CONTROL SYSTEM (AN/SSQ-33A/B(V)	JMCOMS	A	YES	S	H	Imp	99006558	x	$0	$0	300,000		1/97		No ELOC in B10. B11

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SPAWAR SYSTEM INVENTORY

AS OF JULY 25, 1997

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
9	PD17-PMW-176-1	SCSS	SHIPBOARD COMMUNICATION SWITCHING SYSTEM		G	YES	S	H	Ren	99006557	x			184,000		1/97		No system function in A6, activity in A7, ELOC in B10&B11, No POC, No dates in Part F, no costs in Part G
11	PD17-PMW-176-1	ANCC/ATC VC1000	ANCC/ATC VC1000 - AUTOMATED NETWORK CONTROL/AUTO TECH CONTROL (VARCOM)	ANCC/ATC	G	YES	S	E-6	Ren	99000640	x	Blank	Blank	0	240,000	4/97	Also created 186. 187	No System Function in A6, no costs in Part G
186	PD17-PMW-176-1	ANCC/ATC-ASHORE-DMSI	ANCC/ATC-ASHORE NMSS-8000 -DMSI	ANCC/ATC	A	YES	S	E-4	Imp	99006267	x	$0	$0	(blank)	(blank)		Inventory has status G but no problems	No System Function in A6, no system Activity in A7, no ELOC in B10, B11. Problem status "G" but no problems?
187	PD17-PMW-176-1	ANCC/ATC-ASHORE-GSN	ANCC/ATC-ASHORE-GSN	ANCC/ATC	D	YES	S	E-6	Ren	99006268	x	$100	$100	(blank)	(blank)			No ELOC in B10, B11
1	PD17-PMW-176-1 (NISE-EAST)	SRCS	SHORE REMOTE CONTROL SYSTEM	SRCS	G	YES	S	E	Ren	99006250	x	$23	$23	400,000	0	4/97		OK
6	PD17-PMW-176-2	NECC	NAVY EHF COMMUNICATIONS CONTROLLER	ADNS	C	YES	S	H	Ren	99006251	x	$0	$0	0	240,000	4/97		0K
16	PD17-PMW-176-2	TACINTEL II+	TACTICAL INTEL INFO EXCHANGE SYSTEM II	TACINTEL	E	YES	S	H	Ren	31003047	x	$25	$25	0	91,772	4/97	Signed Checklists for Current System and Build 1 New System	OK
188	PD17-PMW-176-2	ADMS	AUTOMATED DIGITAL MULTIPLEXER SYSTEM	ADNS	A	YES	S	H	Imp	99006556	x	$0	$0					ELOC in B10, B11 = "proprietary"
104	PD17-PMW-176-2 (NRaD 84)	BFEM	BATTLE FORCE E-MAIL	-	A	YES	S	H	Imp	99006326	x	$0	$0	0	4MB	4/97		No System Function or Activity in A6, A7; no POC in C4-11
105	PD17-PMW-176-2 (NRaD 84)	JMINI DAMASAC	Joint MILSATCOM Network Integrated Control System	ADNS	J	YES	S	E-5	As	99006275	x	$0	$0	35,000	0	1/97		"0 ELOC" in B10, B11
2	PD17-PMW-176-2 (NRaD 87)	UHF SSA	UHF SATCOM SIGNAL ANALYZER	-	E	YES	S	E-1	Ren	99006259	x	$120	$120	0	100,000	4/97		OK
117	PD17-PMW-176-2 (NRaD 87)	RN SSIXS	ROYAL NAVY SUBMARINE SATELLITE INFORMATION SYSTEM	-	I	YES	S	E-1	Imp	99006258	x	$0	$0	0	64,341	4/97		No POC information in C4 - C11
14	PD17-PMW-176-2 (NRaD)	SSIXS-SMART	SSIXS SUB MSG AUTOMATED ROUTING TERMINAL	SSIXS	J	YES	S	E-3	As	99006265	x	$0	$0	40,000	0	4/97		No POC info in Part C, no dates in F, no costs in G
15	PD17-PMW-176-2 (NRaD)	SSIXS	SUBMARINE SATELLITE INFORMATION EXCHANGE SYSTEM	SSIXS	A	YES	S	E-1	Imp	31002956	x	$0	$0	0	100,000	4/97		No dates in F1,F20, F23, F26, F28, F34, F38; No cost info in G1, G2, G3
19	PD17-PMW-176-2 (NRaD)	TADIXS	TACTICAL DATA INFO EXCHANGE SUBSYSTEM	TADIXS	A	YES	S	E-2	Imp	99000690	x	$0	$0	45,000	0	4/97	Old #122 merged into #19; created 189, 190, 191. DIST 31002575 to be deleted. Former name: OTCIXS TADIXS A.	No POC identified in Part C

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SPAWAR SYSTEM INVENTORY

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189	PD17-PMW-176-2 (NRaD)	ON-143(V)-14/USQ	ON-143(V)-14/USQ-OTCIXS/TADIXS A Satellite Link Controller	-	A	YES	S	E-2	Imp	99006262	x	$0	$0	125,000	0	4/97	Former name: TADIXS - Tactical Data Info Exchange ON143(V)-14/USQ	No information in Part C (POCs), E (Compliance), F (Resolution/schedules) or G (costs)
190	PD17-PMW-176-2 (NRaD)	GFCP I	GENERIC FRONT END COMMUNICATIONS PROCESSOR	TOMA HAWK MDS	A	YES	S	E-2	Imp	99006261	x	$0	$0	12,000	0	4/97	Former Name: TADIXS - Tactical Data Info Exchange GFCP1	No information in Part E (Compliance), F (Resolution/schedules) or G (costs)
191	PD17-PMW-176-2 (NRaD)	SSN GFCP II	SSN GENERIC FRONT-END COMMUNICATIONS PROCESSOR II	-	A	YES	S	E-2	Imp	99006260	x	$0	$0	45,000	0	4/97	Former Name: TADIXS - Tactical Data Info Exchange GFCP2 (SSN GFCP II)	No information in Part C (POCs), E (Compliance), F (Resolution/schedules) or G (costs)
192	PD17-PMW-176-2 (NRaD)	VIXS	VIDEO INFORMATION EXCHANGE SUBSYSTEM	ADNS	A	YES	S	E	Imp	99006253		$0	$0	"N/A"	"N/A"			ELOC is "N/A" in B10, B11
3	PD17-PMW-176-3	MDCS	Mini-DAMA COMMUNICATIONS SET (Was UHF Equipment-UHF SATCOM & LOS Equipment)	UHF SATCOM DAMA	A	YES		H	Imp	99006330	x	$0	$0	100,000	0	4/97	JJih email to 176-3 representatives 4/4 and 5/28 requests action.	No email address in C8
5	PD17-PMW-176-3	MINI DAMA	MINIATURIZED DEMAND ACCESS MULTIPLE ACCESS		A	YES	U		Imp	31002407				160,000	0	1/97		Not received.
7	PD17-PMW-176-3	PORTABLE S	NAVY PORTABLE RADIO PROGRAM	-	J	YES	U	H	As	99006328	x	-	-	"n/a"	"n/a"	4/97	Possible Army responsibility	Lots of "n/a" - does this include software? No ELOC in B10, B11.
12	PD17-PMW-176-3	AN/SRC-54 SINCGARS	AN/SRC-54 SINCGARS SINGLE CHAN GND & AIR RADIO SYSTEM (SHIPBOARD)	SINCTGARS	J	YES	U	E-6	As	99006272	x	$0	$0	(blank)	(blank)		Also created 183	No POC info in C13,C21; no ELOC in B10, B11, no dates in F1,F20,F23,F26,F28,F34,F38; No cost data in G1,G2,G3
17	PD17-PMW-176-3	HSFB	HIGH SPEED FLEET BROADCAST	JMCOMS	J	YES	U	E-4	As	99006269	x	$0	$0	54,400	0	4/97		No dates in F1, F20, F23, F26, F28, F34, F38; no cost info in G1,G2,G3
18	PD17-PMW-176-3	HFRG	HIGH FREQUENCY RADIO GROUP	-	C	YES	U	H *->	Ren	99006324	x			155,000	0	1/97	Inventory is incomplete.	No data in Parts B,C,D,E,F,G,
179	PD17-PMW-176-3	DMR	DIGITAL MODULAR RADIO	JMCOMS	K	YES		E-4	Ren	99006266	x	$0	$0	"TBD"	"TBD"			No System Function in A6, no system Activity in A7, no ELOC in B10, B11, data in E4, E5, E6; no costs in G1,G2,G3
180	PD17-PMW-176-3	DWTS	DIGITAL WIDEBAND TRANSMISSION SYSTEM	-	K	YES		E-5	Ren	99006274	x	$0	$0					No ELOC in B10, B11; dates in Part F; costs in Part G

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181	PD17-PMW-176-3	MERS	MULTIFUNCTIONAL ELECTROMAGNETIC RADIATING SYSTEM	-	K	YES		E-4	Ren	99006270	x	$0	$0	"TBD"	"TBD"			No System Function in A6, no System Activity in A7; no ELOC in B10, B11, no data in E4,E5,E6; no dates in F1,F20, F23,F26, F28, F34,F38; no costs in G1,G2,G3
182	PD17-PMW-176-3	HFSST	HF SMALL SHIP TRANSMITTER		K	YES			Ren	99007701		$0	$0					Not received.
183	PD17-PMW-176-3	AN/ARQ-53 SINCGARS	AN/ARQ-53 SINCGARS-SINGLE CHAN GND & AIR RADIO SYSTEM (AIRBORNE RELAY)	SINCGARS	J	YES	U	E-5	As	99006273	x	$0	$0				Possible Army responsibility	No ELOC in B10, B11; no answers in E4,E5,E6; no dates in F1,F20, F23,F26, F28,F34, F38 ; no costs in G1,G2,G3
184	PD17-PMW-176-3	AN/GRC-211	AN/GRC-211 VHF RADIO	-	A	YES	U	H	Imp	99006329	x	$0	$0	"NA"	"NA"	4/97		Is there software here? No ELOC in B10, B11;no data in Part B
185	PD17-PMW-176-3	MCIXS	MCIXS BATTLE GROUP CELULAR	-	J	YES	U	H	As	99006325	x			"N/A	"N/A"	4/97	"Assessment to be completed 6/1/98"	Is there software here? No ELOC in B10, B11;no data in Part B; Part F incomplete, no costs in G
21	PD17-PMW-176-3 (NISE EAST)	DAMA	DEMAND ASSIGNED MULTIPLE ACCESS	JMCIS	A	YES	U	E-1	Imp	99006257	x	$0	$0	"n/a"	"n/a"		Was UHF DAMA	No ELOC in B10, B11
22	PD17-PMW-176-3 (NISE-P)	AN/URR-79(V)	AN/URR-79(V)-RECEIVE SUBSYSTEM	AN/URR-79(V)	A	YES	U	H	Imp	99006327	x	$0	$0	100,000	0	4/97		No email address in C8 and C18
20	PD17-PMW-176-3 (NRaD 87)	TRE (JTT)	TACTICAL RECEIVE EQUIPMENT (Joint Tactical Terminal) - VME	-	C	YES	U	E-6	Ren	99002722	x	$50	$50	80,000	0	4/97		OK
240	PD17-PMW-176-4	GBS	GLOBAL BROADCAST SERVICE		K	Partial			Ren	99007707		$0	$0					Not received.
10	PD17-PMW-176-4 (NRaD 87)	SHF (AN/WSC-6(V)) - LOCC	SHF-SUPER HIGH FREQUENCY SATCOM TERMINALS (AN/WSC-6(V)) - LOCC	AN/WSC-6(V)	A	YES	S	E-11	Imp	99006312	x	$0	$0	14,360	0	4/97	Split old #10 into 10, 193, 194, 195. One unsigned checklist for all PMW-176-4 systems.	OK
193	PD17-PMW-176-4 (NRaD 87)	SHF (AN/WSC-6(V)) - ACU	SHF-SUPER HIGH FREQUENCY SATCOM TERMINALS (AN/WSC-6(V)) - ACU	AN/WSC-6(V)	A	YES	S	E-11	Imp	(9900 6312 for all WSC-6)	x	$0	$0	16,921	0	4/97		OK
194	PD17-PMW-176-4 (NRaD 87)	SHF (AN/WSC-6(V)) - PA/UIC	SHF-SUPER HIGH FREQUENCY SATCOM TERMINALS (AN/WSC-6(V)) - PA/UIC	AN/WSC-6(V)	A	YES	S	E-11	Imp	(9900 6312 for all WSC-6)	x	$0	$0	4,102	0	4/97		OK
195	PD17-PMW-176-4 (NRaD 87)	SHF (AN/WSC-6(V)) - OM-55	SHF-SUPER HIGH FREQUENCY SATCOM TERMINALS (AN/WSC-6(V)) - OM-55	AN/WSC-6(V)	A	YES	S	E-11	Imp	(9900 6312 for all WSC-6)	x	$0	$0	22,015	0	4/97		OK
196	PD17-PMW-176-4 (NRaD 87)	ATS	AFLOAT TELECOMMUNICATIONS SERVICE		K	YES			Ren	99006743	x	$0	$0					Not received.

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197	PD17-PMW-176-4 (NRaD 87)	TV-DTS	TV DIRECT TO SAILOR		K	YES			Ren	99006744		$0	$0					Not received.
198	PD17-PMW-176-4 (NRaD 87)	LEOSAT/ PCS	LOW EARTH ORBIT SATELLITE/ PERSONAL COMMUNICATIONS SYSTEM		K	YES			Ren	99007705		$0	$0					Not received.
4	PD17-PMW-176-4 (NRaD)	INMARSAT	INTERNATIONAL MARITIME SATELLITE TERMINAL	INMARSAT	A	YES	S	H	Imp	31001970	x	$0	$0	(blank)	(blank)			No ELOC in B10, B11 (is proprietary)
13	PD17-PMW-176-5	EHF LDR	EHF LOW DATA RATE TERMINAL	NESP	E	YES	S	E-3	Ren	31002461	x	$285	$285	64,000	0	4/97	Also created 199 and 200	OK
199	PD17-PMW-176-5 (NRaD 87)	EHF MDR	EHF MEDIUM DATA RATE TERMINAL CONTROL PROCESSOR PROGRAM	-	D	YES	S	E-3	Ren	99006264	x	$0	$0	96,000	0	4/97	Also "NESP MDR"	OK
200	PD17-PMW-176-5 (NRaD 87)	SUB HDR	SUBMARINE HIGH DATA RATE	-	D	YES	S	E-3	Ren	99006263	x	$0	$0	96,000	0	4/97		OK
49	PD18-PMW-181	SSIPS	SHORE SIGNAL & INFORMATION PROCESSING SEGMENT /SURVEILLANCE DIRECTION SYSTEM	FDS	D	YES	S	H	Ren	99006311		$360	$0	400,000	2,000	4/97	Incorporates old #50 (SDS)	OK
51	PD18-PMW-181	SOSUS	SOUND SURVEILLANCE SYSTEM - CONSOLIDATION SUBSYSTEM	SOSUS	G	YES	S	E	Ren	99006271		$620	$620	1,600,000	2,500	4/97	(Was SWS-SOSUS Workstation)	OK
203	PD18-PMW-181	ZEUS	USNS ZEUS MISSION SYSTEM		J	Partial			As	99006781	x						Assessment to begin 7/11, ETC 8/8 (see 7/2 email). Other 7 Zeus systems (#233-239) deleted. See J. Kelly email 6/13.	Not received.
52	PD18-PMW-182	SURTASS (PASSIVE)	SURVEILLANCE TOWED ARRAY SENSOR SYSTEM	IUSS	E	YES	S	E	Ren	99006222		$390	$0	520,000	0	4/97	Also created #201, 202. See also J. Grant review notes.	OK
201	PD18-PMW-182	SURTASS-LFA	SURTASS- LFA LOW FREQUENCY ACTIVE	IUSS	E	YES	S	E	Ren	99006225		$60	$60	400,000	0	4/97		OK
202	PD18-PMW-183	SURTASS-ADS	SURTASS-ADS ADVANCED DEPLOYABLE SYSTEMS	IUSS	E	YES	S	E	Ren	99006224		$0	$0	720,000	0	4/97		OK
53	PD18-PMW-185	TESS (3)	TACTICAL ENVIRONMENTAL SUPPORT SYSTEM	JMCIS	I	YES	S	E	Imp	31003146	x	$0	$0	0	3,600,000	4/97	To be replaced by TESS(NC)?	OK
54	PD18-PMW-185	METMF	METEOROLOGICAL MOBILE FACILITY	JMCIS	A	YES	S	E	Imp	99006313		$0	$0	"n/a"	"n/a"			No ELOC in B10, B11
204	PD18-PMW-185	GFO	GEOSAT FOLLOW ON		J	Partial	S		As	99007702		$0	$0					Not received.
56	PD18-PMW-187	NAVSSI RTS Blk 0	NAVIGATIONAL SENSOR SYSTEM INTERFACE Real Time System Block 0	NAVSSI	J	YES	S	E	As	99002445				110,000	0	1/97	NAVSSI is PD18 pilot for Mitre. POC: LCDR Joe Iacovetta. NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11, no data in E4,E5,E6; no dates in F1, F23, F26, F34, F38; no cost information in G1,G2,G3

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224	PD18-PMW-187	CDNU	CONTROL DISPLAY NAVIGATION UNIT	NAVSTAR GPS	A	YES	S	E	Imp	99006254		$0	$0	0	0	4/97		ELOC = "?" in B10, B11
225	PD18-PMW-187	DDS(MDL)	DDS(MDL) DIGITAL DATA SET	GPS	A	YES	S	E	Imp	99006255		$0	$0	?	?	4/97		ELOC = 0 in B10, B11 yet SLOC = 24,000?
227	PD18-PMW-187	IPGPS/ IIMORROW	GPS Interim Portable Receiver (II Morrow)	NAVSTAR GPS	A	YES	S	E	Imp	99007689		$0	$0	?	?			No ELOC in B11, B12.
228	PD18-PMW-187	IPGPS/ LOWRANCE	GPS Interim Portable Receiver (Lowrance)	NAVSTAR GPS	A	YES	S	E	Imp	99007690		$0	$0	?	?			No ELOC in B11, B12.
229	PD18-PMW-187	IPGPS/ MAGELLAN	GPS Interim Portable Receiver (Magellan)	NAVSTAR GPS	I	YES	S	E	Imp	99007691		$0	$0	?	?			No ELOC in B11, B12.
230	PD18-PMW-187	SABER	SITUATIONAL AWARENESS BEACON WITH REPLAY		K	YES			Ren	99007706							D. Puller working - 4/29	Not received.
231	PD18-PMW-187	GVRC	GVRC		J	YES			As								D. Puller working - 4/29	Not received.
232	PD18-PMW-187	GINA	GPS INERTIAL NAVIGATION ASSEMBLY	T-45A	A	YES	S	E	Imp	99006256		$0	$0	0	35,000	4/97		OK
245	PD18-PMW-187	NAVSSI RTS Blk 1	NAVIGATIONAL SENSOR SYSTEM INTERFACE Real Time System Block 1	NAVSSI	I	YES	S	E	Imp	99006234				0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11.
246	PD18-PMW-187	NAVSSI RTS Blk 2	NAVIGATIONAL SENSOR SYSTEM INTERFACE Real Time System Block 2	NAVSSI	J	YES	S	E	As	99006235				0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11. Status J, Assessment complete 9/30/97. No dates in Part F, no costs in Part G.
247	PD18-PMW-187	NAVSSI RTS Blk 3	NAVIGATIONAL SENSOR SYSTEM INTERFACE Real Time System Block 3	NAVSSI	J	YES	S	E	As	99006236				0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11. Status J, Assessment complete 9/30/97. No dates in Part F, no costs in Part G.
248	PD18-PMW-187	NAVSSI DCS Blk 0	NAVIGATIONAL SENSOR SYSTEM INTERFACE Display Control System Block 0	NAVSSI	J	YES	S	E	As	99006321		-	-	0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11. Status J, Assessment complete 9/30/97. No dates in Part F, no costs in Part G.
249	PD18-PMW-187	NAVSSI DCS Blk 1	NAVIGATIONAL SENSOR SYSTEM INTERFACE Display Control System Block 1	NAVSSI	I	YES	S	E	Imp	99006331		$0	$0	0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11.
250	PD18-PMW-187	NAVSSI DCS Blk 2	NAVIGATIONAL SENSOR SYSTEM INTERFACE Display Control System Block 2	NAVSSI	J	YES	S	E	As	99006322		-	-	0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11. Status J, Assessment complete 9/30/97. No dates in Part F, no costs in Part G.
251	PD18-PMW-187	NAVSSI DCS Blk 3	NAVIGATIONAL SENSOR SYSTEM INTERFACE Display Control System Block 3	NAVSSI	J	YES	S	E	As	99006323		-	-	0	0		NAVSSI Split into 8 systems: #56 and #245-251	No ELOC in B10, B11. Status J, Assessment complete 9/30/97. No dates in Part F, no costs in Part G.

* Checklists: S = Signed, U = Unsigned. **Sys Inv: E = Electronic, H = Hardcopy

SPAWAR SYSTEM INVENTORY

AS OF JULY 25, 1997

ID	REPORTING ACTIVITY	SYSTEM ACRONYM	SYSTEM NAME	PROGRAM ACRONYM	PROB STAT	PROG REV	CK-LIST *	SYS INV **	PHASE	DIST ID	@	Y2K COST ($K)	Y2K Short Fall	WPNS ELOC	AIS ELOC	ELOC Date	NOTES	EVALUATION OF INVENTORY FORM
42	PEO-SCS PMW-101	MIDS LVT	MULTIFUNCTIONAL INFORMATION DISTRIBUTION SYSTEM - LOW VOLUME TERMINAL	-	A	NO	S	E	Imp	31002307		$0	$0	324,526	0	4/97	See Jacobson's email 4/13 "Year 2000 Review". Also DIST 31002306 for MIDS 4	No Tech POC in C12-C21.
39	PEO-SCS PMW-146	UFO	UHF FOLLOW-ON		A	NO	S		Imp	99007703		$0	$0	13,000		1/97	COMPLIANCE DATE-TBD AWAITING USAF GROUND STATION ANALYSIS. They will contact us for review.	Not received.
40	PEO-SCS PMW-159	C2P	COMMAND AND CONTROL PROCESSOR	C2P	A	YES	S	H	Imp	31001272		$0	$0	0	197,000	4/97	NAME WAS C2P (JTIDS)	OK
41	PEO-SCS PMW-159	JTIDS	JOINT TACTICAL INFORMATION DISTRIBUTION SYSTEM	-	A	YES	S	H	Imp	99006223		$0	$0	112,000	0	4/97		OK
43	PEO-SCS PMW-159	NILE	NATO IMPROVED LINK ELEVEN	-	K	YES	S	E	Ren	31002471		$0	$0	0	150,000	4/97	Most checklist questions answered with "unknown."	OK
219	PEO-SCS PMW-159	NSHP-LINK 16	NAVY SHIP HIGH POWER LINK 16/ MIDS ON SUBMARINE	MIDS	A	YES	S	H	Imp	99006220		$0	$0	1,000	0	4/97	New in 4/3/97 review with 220, then combined by J Cheng email OF 4/8/97	OK
221	PEO-SCS PMW-159	CDLMS	COMMON DATA LINK MANAGEMENT SYSTEM	-	A	YES	S	H	Imp	99006310	x	$0	$0	360,000	0	4/97	UPGRADE TO C2P	OK
222	PEO-SCS PMW-159	CSDTS	COMMON SHIPBOARD DATA TERMINAL SET AN/USQ-125 (FORMERLY LINK 11)	-	A	NO	S	H	Imp	99006309	x	$0	$0	8,000	0	4/97		OK
135	SPAWAR 051	AUTO CRLCMP	AUTOMATED CRLCMP PROGRAM		A	NO	S	E	Imp	99006555		$0	$0	-	-		POC = Paul Anderson	No ELOC in B10, B11.
134	SPAWAR 052	REPEATABLE PERFORMANCE EVALUATION AND ANALYSIS TOOL	REPEATABLE PERFORMANCE EVALUATION AND ANALYSIS TOOL		A	NO			Imp	99007704							Paul Anderson is NOT POC	Not received.
139	SPAWAR 07 (was NCCOSC)	ECIM	ECIM - CORPORATE INFORMATION (BUSINESS)		E	NO			Ren								To be replaced by multiple systems. Program review, 5/15/97. 7/23: Voicemail to Doug Hamaguchi.	Not received.
153	X(DELETED) PD17-PMW-176	CUDIXS	CUDIXS (NAVMACS ASHORE)		delete	Partial			Ren		x	?	?				Deleted 7/22 as dupe of #178 in PMW 152. See Jacobson email of 4/13	
226	X(DELETED) PD18-PMW-187	IPGPS/ EPLGR	IPGPS/EPLGR		delete	YES	S		As								Deleted 7/21 per R. Cockerill - is JPO system. Was status J.	
	The following 35 IDs deleted; records still in y2kdb7.xls: 27, 28, 31, 32, 33, 34, 45, 47, 48, 50, 57, 76, 79, 80, 83, 96, 110, 113, 122, 132, 141, 142, 143, 147, 148, 159, 163, 166, 168, 169, 170, 217, 218, 220, 241																	
	The following 11 IDs deleted; records still in y2kdb12.xls: 78, 82, 130, 233, 234, 235, 236, 237, 238, 239, 252.																	

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SPAWAR System Inventory Contents

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
	Part A: System Identification		
A5	System Mission	DoD mission supported by the system. Pick from: Command and Control, Intelligence, Mission Support or Other Missions. See "List A." Multiple entries possible.	C&C: 82 INTEL: 9 MSUP: 16 OTHER: 33
A6	System Function	The function supported by the system. Select from "List A," depending on Mission above. Multiple entries possible.	
A7	System Activity	The activity supported by an application. Select from "List A," depending on Function above. Multiple entries possible.	
	Part B: Software Package Information (multiple entries possible)		
B1	Software Package Type	Application software components (except Operating System, DBMS, or network software identified below) - select: User Interface Package, Software Security Package, Graphics, Data Dictionary, or Case Tool.	User I/F: 97 S/W SEC: 0 GRAPH: 2 DB: 0 OTHER: 10
B2	Software Package Name	The full name of the specific item of software	Gov app: 1
B4	Software Package Vendor	The name of the vendor that supplies or developed the software.	43 VENDORS
B5	Software Package upgrade	Is an upgrade required for Year 2000 problems? (yes/no)	no: 66 yes: 46
B6	Quantity to upgrade	If upgrade required for Year 2000, quantity required (or n/a)	
B7	Programming Language	The programming Language(s) used by the system.	ADA: 33 C: 44 C++:16 ASSEMB: 22 SQL: 8 FORTRAN: 9 PASCAL: 4 CMS-2: 2 JAVA: 1 PROLOG: 1 PEARL: 3 COBAL: 7 FOXPRO: 10 MFPL: 1 CLIPPER: 1
B8	Compiler Availability	Is the compiler/assembler available? (yes/no)	YES: 108 NO: 9

SPAWAR System Inventory Contents

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
B9	Source Lines of Code	Source Lines of Code (SLOC) or Equivalent	
B10	Executable Lines of Code-Weapons Systems	Executable Lines of Code (source code minus overhead data, or use 80% of SLOC) that are part of an "Embedded Weapons System"	11,454,832
B11	Executable Lines of Code-AIS	Executable Lines of Code (source code minus overhead data, or use 80% of SLOC) that are part of an "Automated Information System"	35,414,229
B12	Total Executable Lines of Code	Total of above two numbers	46, 869,061
B13	Lines of Code to convert for Year 2000	Estimated Lines of Code that must be converted for Year 2000	
B14	Documentation	Is Requirements and Design Documentation available? (Yes/No)	YES: 93 NO: 18
B15	Source Code Availability	Is source code available? (Yes/No)	YES: 106 NO: 14
B16	Date Related Modules/files	Percent of software modules/files that is date related	0%: 15 1%: 9 2%: 4 5%: 10 7%: 3 10%: 11 15%: 5 20%: 5 25%: 12 30%: 1 40%: 2 50%: 9 75%: 2 80%: 1 90%: 2
	Date Related Code	Percent of Source code that is date related	0%: 15 1%: 18 2%: 6 3%: 14 5%: 25 10%: 11 15%: 2 20%: 1 50%: 1
B17	Date Formats	Consistency within the system of a standard date format (high, medium, low)	HI: 70 MED: 24 LOW: 3
B18	Do the following Year 2000 Problems Exist:		
B19	Two-digit year	Yes/no	YES: 66 NO: 49
B20	Six-digit date (e.g., mm/dd/yy)	Yes/no	YES: 39 NO: 76
B21	Leap year errors	Yes/no	YES: 17 NO: 101
B22	Inaccurate date calculations	Computations, comparisons, assignments, other operations (yes/no)	YES: 38 NO: 83
B23	On-Line screen changes	Yes/no	YES: 37 NO: 82

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
B24	Report form changes	Yes/no	YES: 30 NO: 87
	Support Software Information		
B25	Operating System Name	The operating system used	34 O/S BRANDS
B26	Operating System Version	A unique identifier of a version or release of the operating system.	see E
	Operating System Vendor	The name of the vendor that supplies or developed the operating system.	24 VENDORS REPRESENTED
B27	Operating System Upgrade	Is an Operating System Upgrade required for Year 2000 problems? (yes/no)	YES: 38 NO: 62
B28			
B29	Data Base Management System (DBMS) name (if used)	The DBMS used	YES: 40 NO: 30 DBMS: 13
B30	DBMS Version	A unique identifier of a version or release of the DBMS.	n/a:
B31	DBMS Vendor	The name of the vendor that supplies or developed the DBMS.	12 VENDORS
B32	DBMS Elements	Number of date-related data elements	20, 10, 15, 120, 3, 3, 2640, 330, 20, 5000, 6, 75, 75, 23, 20, 15, 45, 45, 20, 15, 135, 19, 725, 20
B34	DBMS Upgrade	Is a DBMS Upgrade required for Year 2000 problems? (yes/no)	YES: 4 NO: 48
	Part C: Organization/Points of Contact (multiple entries possible)		
	Part D: Hardware Information (multiple entries possible)		
D1	Hardware type	Specify: Processor (CPU), communications devices, or data storage devices	CPU: 99 COMM: 11 DS: 3 OTHER: 4 MULT: 9

SPAWAR System Inventory Contents

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
D2	Hardware Size	Specify: Mainframe, Micro, Mini, Supercomputer, Workstation, or unknown	M/F: 0 Micro: 37 Mini: 17 W/S: 41 PC: 2 Embedded: 11
D5	Hardware Manufacturer	Manufacturer of Hardware Platform(s)	~46 VENDORS
D6	Hardware upgrade	Is an upgrade required for Year 2000 problems? (Yes/no)	YES: 8 NO: 100
D8	BIOS Compliance	Is the hardware Basic Input/Output System (BIOS) Year 2000 compliant? (yes/no)	YES: 72 NO: 14
	Interface Information (multiple entries possible)		
D17	Input Bridge	Will bridges be required for Y2K compliance of data inputs? (yes/no)	YES: 1 NO: 79
D18	Output Bridge	Will bridges be required for Y2K compliance of data outputs? (yes/no)	YES: 1 NO: 79
	Part E: Year 2000 Compliance		
E1	Y2K Problem Status	A = Assessment complete; No known Problem with Year 2000	51
		B = Known Problem; fix already in place	1
		C = Known Problem; fix in next release	16
		D = Known Problem; fix under development	10
		E = Known Problem; will fix before year 2000	21
		F = Known Problem; fix dependent on tools (software engineering environment)	0
		G = Known Problem; fix dependent on COTS (hardware or software upgrade)	14
		H = Known Problem; will not fix	2
		I = System to be terminated before fiscal year 2000	7
		J = Assessment not completed	18
		K = Under acquisition/development	20
E2	System Termination Date	If Status above is J, date system will be terminated	_____
E4	Y2K Hardware Platform Compliance	Is the Hardware Y2K Compliant? (yes/no)	YES: 87 NO: 7

SPAWAR System Inventory Contents

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
E5	Y2K Operating System Compliance	Is the Operating System Year 2000 Compliant? (yes/no)	YES: 64 NO: 27
E6	Y2K System Application(s) Compliance	Are the system applications Year 2000 Compliant? (yes/no)	YES: 61 NO: 29
E7	Sort Routine Compliance	Are the sort routines Year 2000 Compliant? (yes/no)	YES: 59 NO: 12 N/A 27
E8	Backup Routine Compliance	Are the backup routines Year 2000 Compliant? (yes/no)	YES: 60 NO: 8 N/A: 25
E9	Archival Routine Compliance	Are the archival routines Year 2000 Compliant? (yes/no)	YES: 52 NO: 6 N/A: 33

End of Survey for systems with no Previous/Current/Future Year 2000 problems (i.e., status A or I above)

Part F: Year 2000 Resolution Risks and Status

F1	Date System Application(s) will be Y2K Compliant	The estimated date of systems application(s) Y2K compliance (mm/dd/yyyy)	_____
F2	Unfixed Y2K Problems	If the system has a known problem that will not be fixed, please explain.	YES: 0
	Year 2000 Strategy you will use:		
F3	Field Expansion	Yes/no	YES: 30 NO: 24
F4	Procedural code	Yes/no	YES: 31 NO: 22
F5	Sliding Window	Yes/no	YES: 12 NO: 40
F6	Other	Describe	YES: 4 NO: 46
F7	Tools to Find	Will tools be used to fix Y2K Problems? (yes/no)	YES: 25 NO: 30
F8	Tools to Fix	Will tools be used to find Y2K Problems? (yes/no)	YES: 8 NO: 45
F9	Tool Availability	Are Programmer/System software utilities and development tools available to support software changes (yes/no)	YES: 42 NO: 8
F10	Application Expertise	RED: low programmer familiarity with application; YELLOW: medium familiarity; GREEN: high familiarity	RED: 1 YELLOW: 10 GREEN: 47

SPAWAR System Inventory Contents

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
F11	Language Expertise	RED: low programmer familiarity with programming language; YELLOW: medium familiarity; GREEN: high familiarity	RED: 0 YELLOW: 3 GREEN: 55
F12	Special Upgrade	Will Year 2000 fixes require a special upgrade or installation (as opposed to normal release cycle) (yes/no)	YES: 13 NO: 42
F13	Mission Criticality/Risk	RED: System is critical to the mission; YELLOW: workarounds are possible for the short term; GREEN: workarounds can be used indefinitely	RED: 18 YELLOW: 29 GREEN: 10
F14	Technical Risk	RED: High number of interfaces, COTS, poor availability of code, etc.; YELLOW: moderate complexity; GREEN: low complexity	RED: 6 YELLOW: 14 GREEN: 37
F15	Funding Resources Risk	RED: Poor/no availability to solve problem; YELLOW: moderate availability; GREEN: adequate availability	RED: 15 YELLOW: 19 GREEN: 15
F16	People Resources Risk	same as above	RED: 12 YELLOW: 13 GREEN: 31
F17	Facilities Resources Risk	same as above	RED: 9 YELLOW: 14 GREEN: 33
F18	Contractor Support Risk	same as above	RED: 10 YELLOW: 6 GREEN: 39
F19	Time/Schedule Risk	RED: Inadequate time left until target date; YELLOW: marginal time left; GREEN: adequate time left	RED: 1 YELLOW: 16 GREEN: 39

Assessment Phase

Validation Phase

Implementation Phase

Date System will be Certified as Y2K Compliant

Part G: Year 2000 Compliance Costs

SPAWAR System Inventory Contents

Field Number	FIELD IDENTIFIER	DEFINITION	YOUR SYSTEM
G1	HW and System Software Cost	Estimated Year 2000 Resolution Cost for Hardware (HW) and Operating Systems (OS) (in $thousands)	
G2	HW and OS Budget Shortfall	Hardware and Operating System Software Year 2000 Compliance Budget Shortfall (in $thousands)	
G3	App Software Y2K Compliance Cost	The cost to bring application software into Y2K compliance (in $thousands)	
G4	Application Software Y2K Compliance Cost	The cost to bring application software into Y21K compliance (in $thousands)	_____
G5	New Needs	Have you made or do you anticipate making any "new needs" requests for your Year 2000 project, as opposed to providing for it through budget reallocations? If yes, provide details of the request.	_____
G6	Level of effort	How many person-work years do you estimate will be devoted to your "Year 2000" project?	
G7	In-House Work	What proportion of the Year 2000 work will be done in-house? (percent)	1%: 1 5%: 2 25%: 2 50%: 3 60%: 3 100%: 21
G8	Outsourced work	What dollar value of Year 2000 work will be outsourced? ($thousands)	
G9	Contract Value	What dollar value of existing or anticipated maintenance or support contracts involve a substantial component of Year 2000 work? ($thousands)	_____

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4) "The Year 2000 Problem", MITRE Webpage

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